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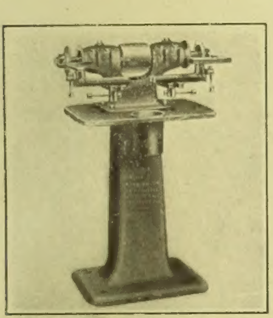
CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

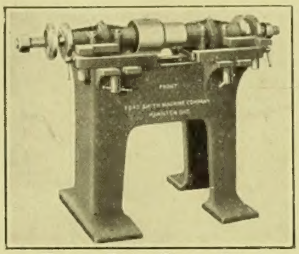
30999

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

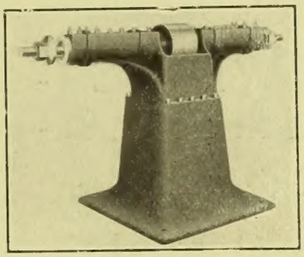
VOL. IX. PUBLICATION OFFICE, TORONTO, JANUARY, 1918 No. 1



Light Type Floor Grinders

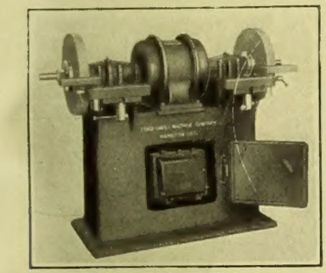


Heavy Type Floor Grinders

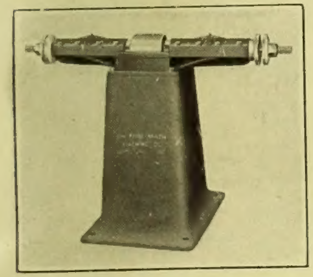


Plow Grinders

Water Tool Grinders



Motor-Driven Grinders



Heavy Type Polishers

Ford-Smith Grinders

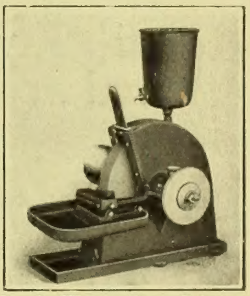
At this, the beginning of a New Year, we are in better position than ever to fill your orders, as our plant is considerably increased.

Our line of Foundry and Machine Shop Grinding Machinery needs no boosting. They are already well known as to their merits. Our Catalog is sent on request.

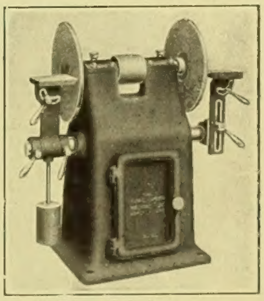
Canadian Grinders for Canadian Factories

The Ford-Smith Machine Co.
LIMITED

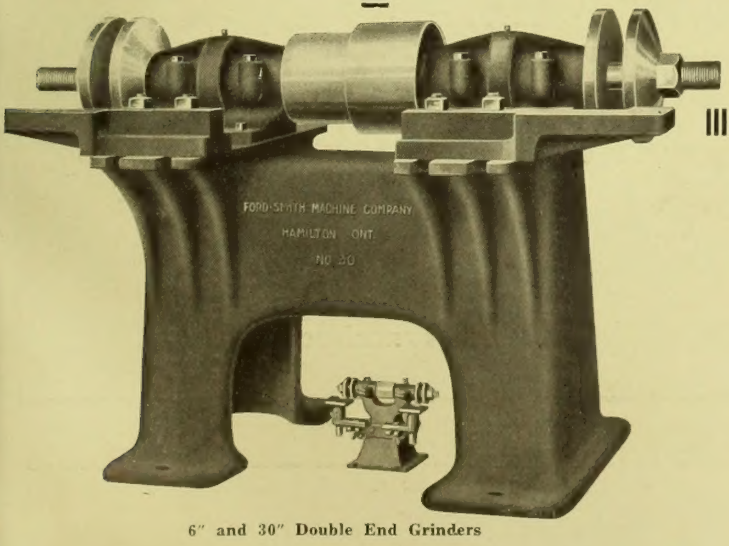
Hamilton, Canada



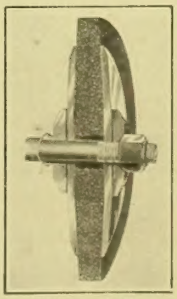
Bench Water Tool Grinders



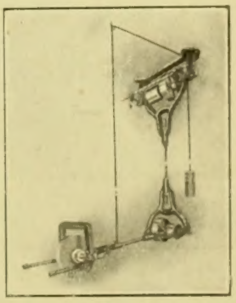
Disc Grinders



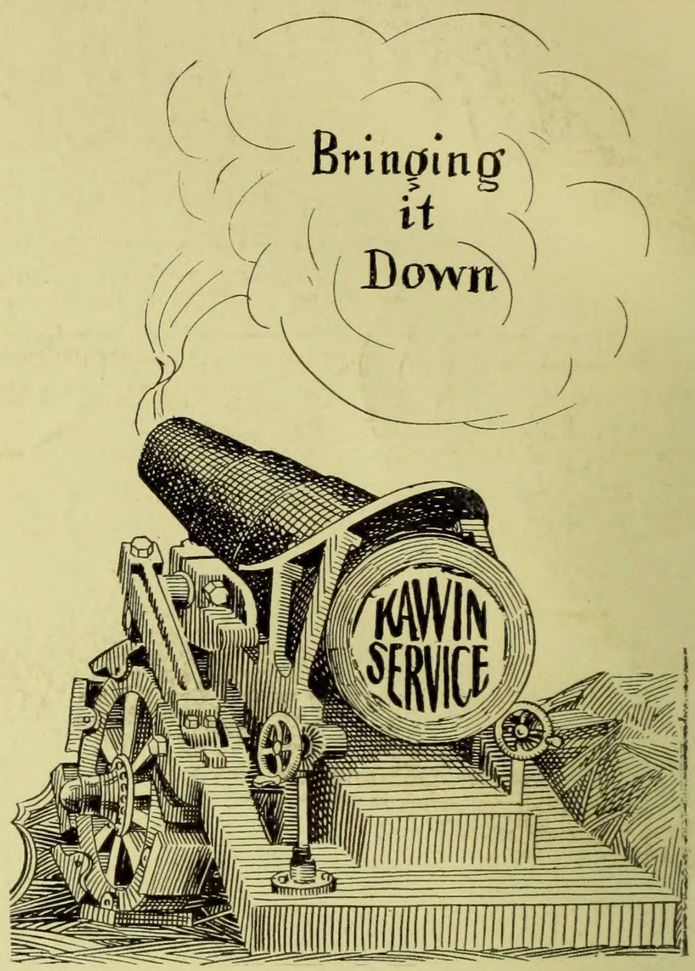
6" and 30" Double End Grinders



Safety Collars



Swing Grinders



Turn the KAWIN SERVICE guns on the production costs of your plant.

We have specialized in foundry practice and we will guarantee that the results of our experience will save you 100% over and above the cost of the

KAWIN SERVICE

Cost of production is on the upward trend owing to the scarcity of labor and other conditions due to the war. But there's a big measure of relief in sight for you. Just give the **Kawin Service Staff** an opportunity to operate in your plant. They will stop leaks you never knew existed and show you how to get more work and better work for your money.

Kawin Service includes chemists, metallurgists and practical foundrymen, all of first-class experience and students of efficient and economical production.

Kawin Service has scored many notable successes in Canada and United States. Never has failed to give paying results. You need this service now as never before. Consult us immediately.

Charles C. Kawin Company, Limited

Chemists, Metallurgists, Foundry Advisers - 307 Kent Building, Toronto

Chicago, Ill. **Dayton, Ohio** **San Francisco, Cal.**

Woodison's Ad

Published once a month by
THE E. J. WOODISON COMPANY
Toronto, Montreal and Windsor

FIRE BRICK
FOUNDRY REQUISITES
PLATERS' AND POLISHERS' SUPPLIES

TRY WOODISON'S METHOD
"Buy the best—it is the cheapest in the long run"

A SUCCESSFUL BRASS FURNACE

Operates at Low Cost

By properly arranging the area of flue and grate openings with relation to the combustion chamber, in the Woodison Brass Furnace, we obtain increased heat with the same fuel by keeping the heat at the proper spot. This feature enables you to get from 33 1-3% to 50% greater melting capacity from the same amount of fuel.

Any Woodison Furnace may be arranged for either a "solid cast" drop-grate, a "draw-bar" drop-grate, or a "fixed" draw-bar grate. In the first two grates ("drop" pattern) the hinge lugs from which the grate swings, are located at the rear of the furnace, allowing sufficient space for resting the bottom plate on the mason work in the rear. The grate is swung shut by a chain from the foundry floor, and locked by a chain catch.

In the "fixed" grate the draw-bars are set in rests at the front and rear of the furnace, and, when dropping the fire, may be withdrawn by your "pick-up tongs" from the foundry floor. The dropping operation in any case is made from the foundry floor, getting away from any possibility of accident.

We will be glad to furnish you with proper specifications for the size of your pit, for the size of the main flue and for the location of the main flue.

Any further details will be promptly sent you on receipt of request.

OTHER THINGS

There are any number of supplies that you are using from day to day in your foundry, core-room, cleaning-room, and pattern shop. We can mention a few of them in this column, for instance: Pattern lumber, fillet, letters, flask-clamps, steel bottom-plates, mallets, torches, tumblers, stars, gaggers, Woodseed Liquid Core Compound, etc.

All of the above, we can supply you with together with anything else that you may need in any of the above-mentioned departments.

Write for our New Catalog giving a complete list of foundry supplies, fire brick, and platers' and polishers' supplies. It's yours for the asking.

A FORTUNATE CONDITION

Tin plate is a mighty difficult article to obtain these days. We foresaw that such would be the case and so quite a while ago we stocked our Perforated Chaplet department with plenty of the necessary tin plate with which to fill your chaplet orders.

No long, tiresome waits when you order of us; we have just what you want.

We are making all of the standard sizes and any special sizes that you may desire.

With our Perfect Perforated Chaplets you are assured perfect ventilation, eliminating all possibilities of blow-holes, air-pockets, etc., forming a perfect union with the molten metal, and thereby insuring an absolute pressure-tight joint. That's something not obtained on thin work with any other chaplet.

Brass foundrymen find our special perforated Aluminum chaplets of great advantage in the foundry.

When ordering please state the thickness of chaplets; the width; the length. When curved chaplets are desired don't fail to give the diameter of the core.

Send in your orders now; they'll receive our prompt attention.

ORDER YOUR FIRE BRICK NOW

Do not hesitate in placing your orders for Fire Brick as there are several good reasons for ordering right now. One of the reasons is that the U.S. government is using so much rolling-stock in getting export shipments to the coast, and lumber to the various cantonments that a very serious car shortage is almost bound to occur.

Then too, the brick-yards are working to full capacity now and are making shipment of orders in rotation only, so it's first come first served.

Anticipate your wants in this line as much as possible so that when the time comes that you need brick, you will not be found on the waiting list.

We are in position to serve you with the same reliable grades as before and await your orders for anything you may need in the fire brick line, including cupola blocks, tile and Brass Furnace linings.

PROVEN PLUMBAGO

That's the only kind we have for sale. The quality is determined by the amount of graphitic carbon and the low percentage of ash.

We do no refining, but buy our plumbago in original packages direct from Ceylon. All grades are purchased on guaranteed analyses and are tested when they reach us. Therefore we can always duplicate the last shipment made. Enterprising grinders in this country, in order to make an attractive price use various adulterants to cheapen the material. Beware of these price-cutters as you only get what you pay for after all. You may save a half-cent a pound in your first cost and spend several cents in your cleaning-room.

Among the several grades that we have to offer the trade, there is none more popular than our No. 614 Plumbago. It has all of the earmarks of quality and you should not delay a minute in placing a trial order for a barrel.

It can be dusted, rubbed, or slicked on a mold and it will not wash or run before the metal. Furthermore the castings will peel from the sand readily and will come out with that clean, blue grey appearance that is so much desired by foundrymen and machinists alike.

This is the best general-purpose plumbago that we know of on the market to-day.

We are prepared to serve you with this and anything else you may need in our line from our well-filled warehouse stocks at the following cities:

Toronto
Windsor
Boston
Buffalo
Detroit
Portland, Ore.
Seattle

The Publisher's Page

TORONTO JANUARY 1918

The Economy of Business Paper Advertising

By H. E. CLELAND, NEW YORK

Awarded the Higham prize at the convention of Associated Advertising Clubs, at St. Louis, June 1917. This prize is given annually to the one delivering the most constructive address in the fewest words.

(Continued from last month)

THE time is coming when the principle of intensive advertising will be universally recognized and followed.

Manufacturers of machines and material and equipment which are sold direct to the consumer in technical fields will advertise them in technical papers.

Manufacturers of merchandise sold through retailers will advertise in trade papers first and will no longer be lured into attempting to sidestep the dealer. They will do the first thing first.

Manufacturers of merchandise selling to the general public will establish consumer demand (after distribution has been properly taken care of) by the zone system, using newspapers and outdoor advertising.

Advertisers to the general public with a thoroughly established distributing system will use newspapers and national mediums of many different kinds.

And advertising will reach the high plane that it is destined for only when all advertising men place their business along these lines, and only when the salesmen of different branches of advertising recognize that predatory invasion of the other man's field is the deadliest way to destroy confidence in all advertising.

We cannot force the super-tax of advertising extravagance upon the manufacturers of the world without eventually paying for it ourselves.

No wise salesman knowingly overstocks a dealer. No wise manufacturer of machinery ever recommends the use of his machine in order to make a sale if that machine will not fit the consumer's conditions. No up-standing and honest and far-seeing man will make a contract that does not benefit his customer as well as himself.

Advertising men must follow these methods or kill the goods.

Therefore, advertising men will advocate the use of mediums that present the utmost in efficient economy for the advertiser.

Which means that for certain classes of services, machinery, material, equipment and merchandise, the business papers will be used to their fullest extent. They must be used up to but not beyond the line of their efficiency.

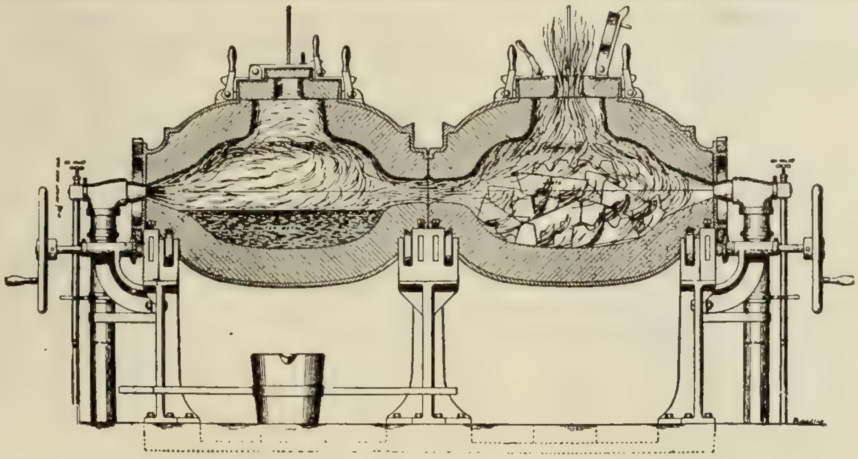
And the business papers must continue the practice that all of the worth-while of them follow now—they must decline advertising which is not in the business line of the paper. To do otherwise is to destroy the principle of the specialized publication.

For those things which "belong" in a business paper—but for no others—the business paper presents the most economical method of efficient advertising.

The Allies will Win ***Their Cause only is Just***

Monarch Furnaces

NO CRUCIBLE



OIL OR GAS

Continuous Melting

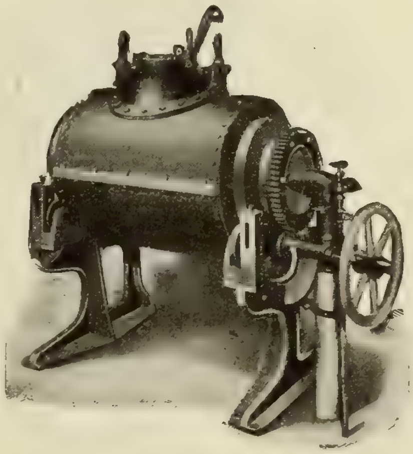
To lower melting cost, a furnace without equal is the Monarch Double-Chamber Rockwell. It utilizes all the heat.

Exhaust heat from the primary chamber flows into the other chamber. While the metal in the primary chamber melts, metal in the other chamber is heated to the melting point before the direct heat from the one low-pressure oil or gas burner is put upon it; consequently it is brought rapidly to molten state without loss from oxidation. With the quantity of fuel an ordinary single-chamber furnace demands, this Monarch Double-Chamber Furnace melts almost twice the metal in half the time.

Each chamber is a lined steel shell, split longitudinally through its axis and hinged on one side. Mounted horizontally in line on three under-cut stands, which are set on a cast iron base as a unit, both chambers revolve freely and independently on rollers by means of a worm gear and hand wheel.

At the Tonopah-Belmont Mill, within 12 months, this Monarch Double-Chamber Rockwell Furnace melted 3,805,789.29 fine ounces of bullion at a total cost per ounce of $0.002435. And melting copper, brass, bronze, aluminum, etc., it has set a standard no other furnace has approached.

Write NOW for Catalog.



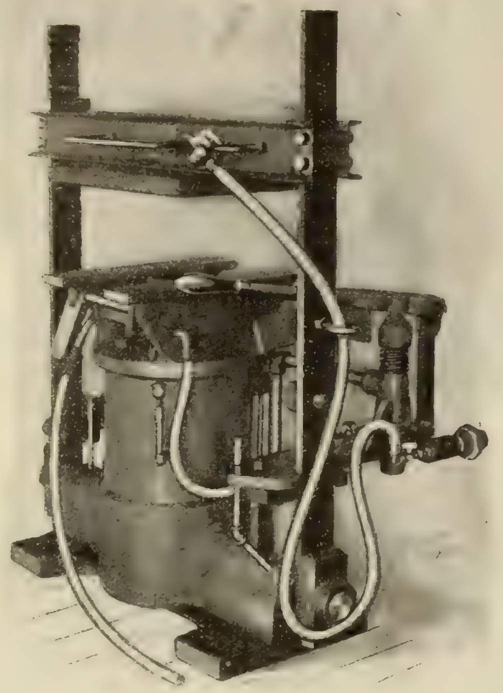
Monarch Rockwell Single Chamber Furnace—"Simplex"

The fastest heating, fuel-economizing Furnace in the Single Chamber type. In construction and material as good as the Monarch Double-Chamber Furnace, but without its continuous heating feature.

The Monarch Engineering & Mfg. Company

1206 American Building, Baltimore, Md., U.S.A.

Shops at Curtis Bay, Md.



TABOR
10-inch Power Squeezer

TABOR

10" Power Squeezer

Designed especially for use in molding light snap flask work in large or small quantities. The Tabor 10" Power Squeezer combines with simplicity and durability the highest efficiency for the rapid production of bench work requiring flasks up to and including 14 by 20 inches, or the equivalent. Absolute uniformity in density of sand is obtained, and consequently the loss of castings, due to swelling or blowing of the molds, is reduced to a minimum.

Send for Bulletin M. R.

The Tabor Mfg. Co.

18th and Hamilton Sts.
PHILADELPHIA, PA., U. S. A.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel** for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

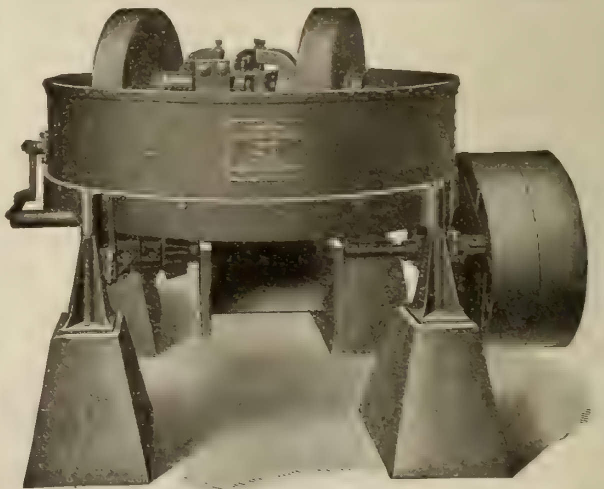
Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

A Message to Canadian Foundries
THE SIMPSON INTENSIVE FOUNDRY MIXER
Saves Both Sand and Labor

Improves the quality of the castings.
Corrects "scabbing" due to imperfect mixing of facing sand.
Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.

Write for details and prices to

National Engineering Co.
Room 505, Tacoma Bldg.
CHICAGO, Ill.

Where We Are Located

OUR offices in the ground floor of the New Birks Bldg., Phillips Square, Montreal, are most centrally located. The building is one of the most modern in Montreal and is in keeping with the "Hyde Service."

Our staff working under the most advantageous conditions are in a position to give to our customers the maximum of service.

An inquiry for a small quantity of supplies or information in regard to any of your problems will receive the same attention as an inquiry for a complete foundry equipment.

If you have never become acquainted with us, let's get together now to our mutual advantage. We can advise you regarding any branch of foundry practice.

WRITE US

HYDE & SONS, Limited

FOUNDRY SUPPLIES AND EQUIPMENT

New Birks Building MONTREAL

OUR LINE:

FURNACES—

Electric,
Open-Hearth,
for
Steel,
Iron,
Nickel,
Copper,
Brass,
All Ores
and
Ferro Alloys.

BRICKS—

Fire Clay,
Magnesite,
Chrome,
Carborundum,
Silica,
Clays and Sands,
Ganister,
Cupolas,
Crucibles,
Pig Iron,
Coke,
etc., etc.

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

English Moulding Machines

"Jarr" Ramming
"Head" Ramming
"Hand" Ramming

The most efficient on the market.
Well built to suit rough usage.

Write for particulars to the makers.

Britannia Foundry Company
Coventry, England

USE KAOLIN

For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

It will save your fire brick and the time of your men.

Whitehead Bros. Co.

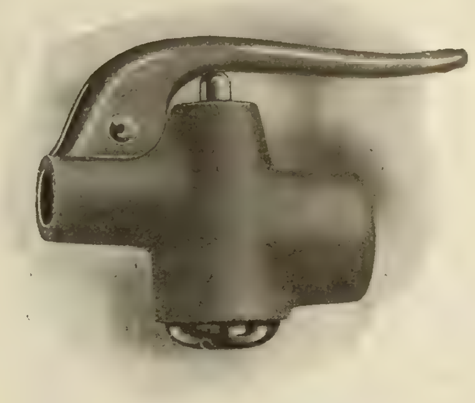
Providence
New York
Buffalo

THE STANDARD IN CRUCIBLES

Manufactured For Over 50 Years

J. H. Gautier & Co.

JERSEY CITY, N.J. U.S.A.



"IMPERIAL" BLOW GUN

**The Pneumatic Way
The Best To-day**

BELLOWS AND BRUSHES FOR BLOWING AND CLEANING NO LONGER NECESSARY

In modern foundries, air jet cleaning nozzles or "blow guns" are fast superseding bellows, brushes and cloths for practically all cleaning operations. These air appliances are very effective and convenient, and contact of the appliance with the work to be cleaned is unnecessary, thus avoiding injury to the most delicate mould, and loss of time in "slicking up" afterwards.

Our "IMPERIAL" Blow Gun

has been specially designed for quick action and economy in the use of air. Our Bulletin K-600 tells of other features. Write for it.

Send for bulletin on "Little David" Drills, Grinders, Chipping Hammers, etc., also "Imperial" Hoists and "Crown" Sand Rammers.

CANADIAN INGERSOLL-RAND CO., Ltd.

General Offices: Commercial Union Bld., Montreal, Que.

Branches:
Sydney, N.S.
Sherbrooke, Que.
Montreal, Que.
Toronto, Ont.
Cobalt, Ont.

Branches:
Timmins, Ont.
Winnipeg, Man.
Nelson, B.C.
Vancouver, B.C.
New York, N.Y.

LONDON, ENG.

Foundry Chaplets

of Every Description

We Take Care of You

Forged, Riveted or Electric Welded

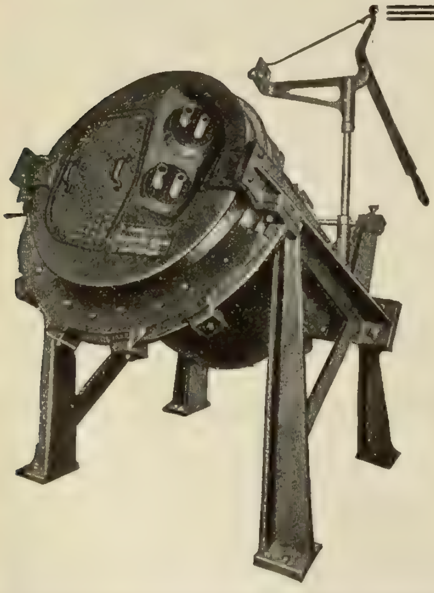
TUMBLING STAR

Made for the Tumbling Barrels of a Special Grade of Iron

THEY ARE HARD—THEY WILL LAST

Write Department C.

The Fanner Mfg.. Co.
Cleveland
Ohio.



Maximum Service **SLY**

Sand Blast

It looks to have bull dog strength—and it has. Let it take hold of your work and you'll see it's like the bull dog in another respect.

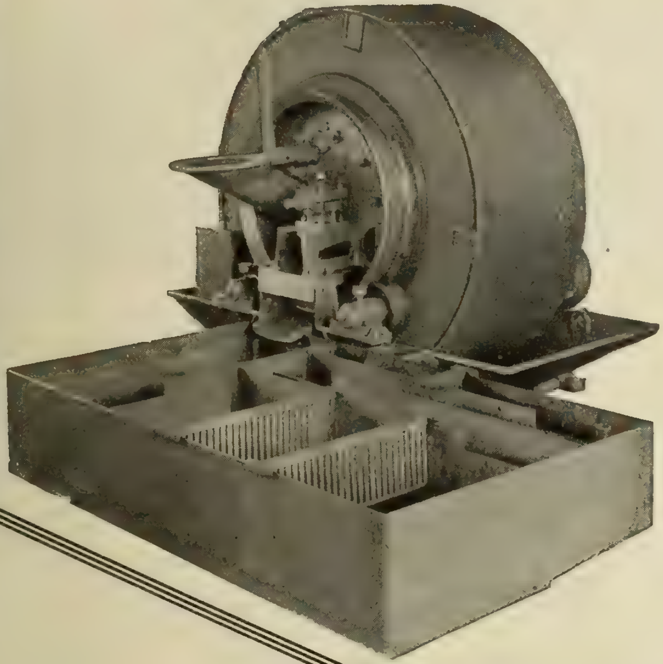
The Sly Sand Blast is widely known for strength and great efficiency. Superior to others in every respect—vastly superior in nozzle construction. Clean change of castings in remarkably short time.

Write for particulars of Sly Efficiency.

- **Core Ovens**
- **Cranes**
- **Core Sand Reclaimers**
- **Sand Blast Rotary Tables**
- **Rosin Mills**
- **Sand Blast Mills**
- **Sand Blast Rooms**
- **Ladles**
- **Cleaning Mills**
- **Cinder Mills**
- **Dust Arresters**
- **Cupolas**
- **Sand Blast Machines**

The W. W. Sly Manufacturing Co. **Cleveland, Ohio, U.S.A.**

Standard Mill



It reclaims all metal in cinders, slag, skimmings, old crucibles, etc. Built in four different sizes. Will crush and pulverize 600 to 6,000 lbs. **per hour** requiring 2½ to 7½ H.P. circulating same water over and over.

The Standard Mill is ready to operate as soon as you uncrate it. Pits under floor or special foundations are **not** needed. Lists of Canadian Foundries using it with great profit may be obtained for the asking. Write for Catalogue "C."

The Standard Equipment Company
Manufacturers of
Special Foundry Machinery
New Haven, Conn., U.S.A.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

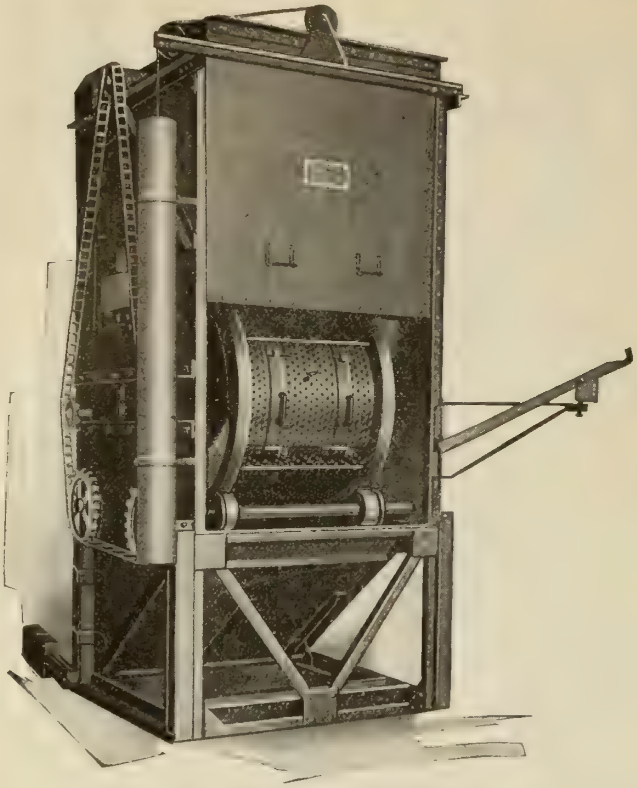
Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

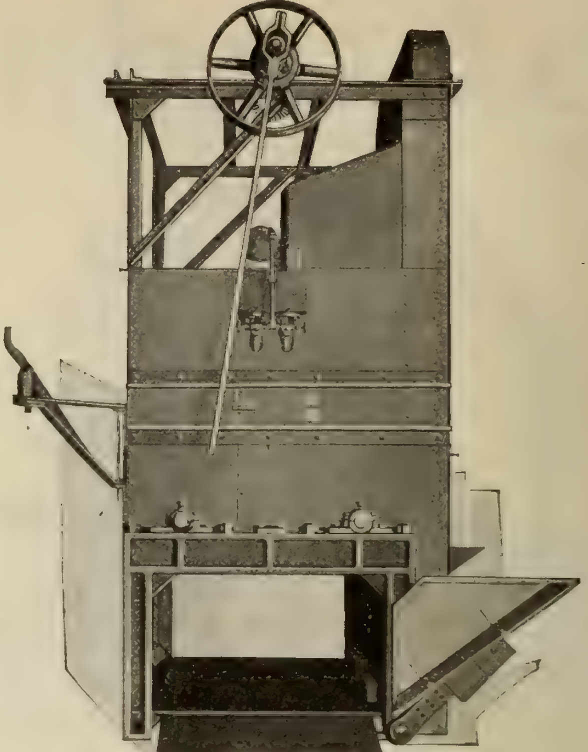
SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO



Front View With Sliding Door Raised

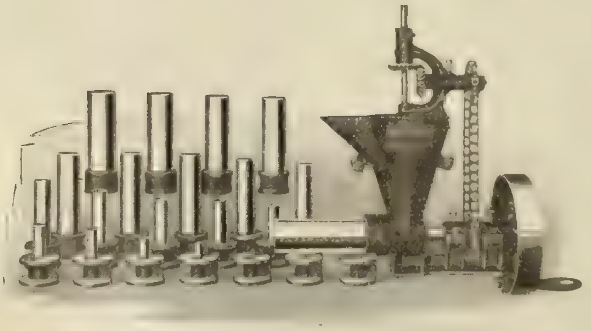


Side View. Truck is Run Underneath Barrel

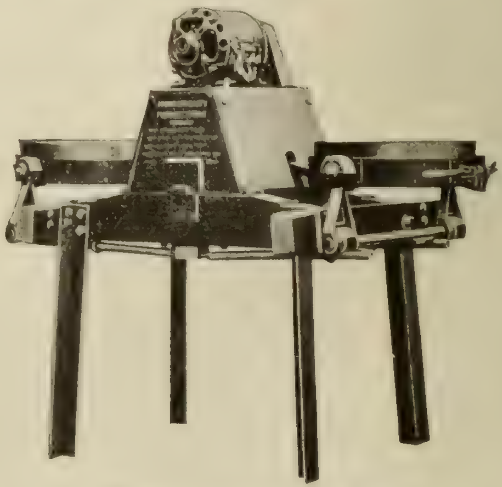
No. 3 Revolving Barrel Sandblast Machine

showing front and side views. Truck is run directly underneath the barrel and load is automatically dumped when the barrel revolves.

We will gladly refer you to malleable steel and iron manufacturers who are operating one or more of these barrels. Many of them have competing makes and can give comparative results. Learn from the operators what results they are getting.



Style A Hammer Core Machine
Other styles to make up to 7" round cores



Electric Duplex Shaker
The fastest, most substantial shaker built

Send for Catalogues

Brown Specialty Machinery Company

2424 West 22nd Street, Chicago

Canada Stove & Foundry Co'y.

Plant and Product

Ville St. Laurent, Montreal.

Times like the present have produced many contrasts, and few indeed are the factories whose products are not contributory to the arts of both peace and war. That the greater portion of this plant's activity should be devoted to developing the manufacture of peace-time products is a pleasing feature at this time, having in view the economic necessity of maintaining staple lines of industry in active readiness for the return of peace.

RAPID development of plants has been a notable feature of manufacturing activities throughout the Dominion during the past three years, but with few exceptions such expansion has resulted from the urgency of war requirements—directly or indirectly—rather than a marked extension in staple manufacturing. Domestic enterprise, even on a normal basis, has suffered extensively through the high cost of raw materials and the difficulty of obtaining such, except under restricted conditions. One of the few exceptions to these conditions is the plant of the Canada Stove and Foundry Company, Ltd., Ville St. Laurent, near Montreal. This company was incorporated in May, 1916, as successors to the Canada Stove and Furniture Company, the latter having been organized in 1905. Steady progress was made by that company until 1913, by which time the output had attained comparatively large dimensions, and the factory occupied a floor space of 50,000 sq. ft. The rapid growth of the business, however, during the next three years necessitated the building of extensive additions, and in the summer of 1916 the two storey mounting room, the warehouse and foundry were extended; later in the same year a four-storey building was erected for the manufacture of shells, and a storage warehouse.

An entirely new departure was decided on at this time, viz., that of enamelling sheet steel goods and cast iron hollow ware, and a suitable building was erected for this purpose on the property facing the main offices; these latter also being remodeled during the same period. The present floor space available for manufacturing purposes is about 200,000 sq. ft., and together with the adjoining property covers an area of 10 acres. The plant is ideally situated, being located about 7 miles from the city of Montreal, and adjacent to the main line of the G.T.R., with spur connections to both the C.P.R. and the C.N.R.

Foundry

The foundry has a length of 300 ft. and a width of 150 ft. and with the exception of a small section used for heavy pit work, the floor is constructed of concrete, this being considered an efficiency feature where light work predominates. The greater volume of work is connected with the manufacture of stoves and ranges, but considerable jobbing is also done; facilities having been installed to handle individual castings of about 3 tons in weight. A 66 in. Whiting cupola, with a capacity of over 30 tons per day, is located in a wing about midway of the shop length; a Piqua pressure blower being installed to supply the necessary blast. For small plate-moulding work, 50 lb. ladles are provided, and for the larger work several ladles ranging from 200 lbs. to about 4,000 lbs. are employed, these latter being transported about the shop by a monorail system. Pouring is continuous for about three hours each day.

The bulk of the light work is performed in moulding machines; the equipment consisting of 2 Pridmore rockover machines, 3 Arcades, 2 Webb and 3 Davenport power air squeezers, and 2 Adam's hand squeezers. For the baking of cores there has been installed one large Whiting and four small Millett core ovens. The foundry is well lighted, and heated by a forced hot air system with overhead piping, installed by the Canadian Sirocco Co. The remainder

VIEW IN ONE OF THE FOUR BAYS OF THE FOUNDRY

of the factory is heated by means of steam coils.

Mill Department

For the cleaning of the castings 10 Sly steel mills are installed, these ranging from the large size of 4 ft. square and 50 in. long, to the small size of 18 in. dia. and 3 ft. long. Each mill is equipped with Sly dust arrestors, insuring the maximum degree of cleanliness possible in this dusty department. For the larger castings, and those that are too delicate to place in the tumbling mills, a sand blasting equipment has been provided. Adjoining the mill room is the stove parts stock department into which the castings are taken from the cleaning room and stored in suitably arranged bins so that the parts are at all times easily accessible.

Efficient Stock Record System

On the first floor of the stove mounting department is the steel stock and cutting room, the former so arranged and managed that it is possible to determine at any time, by reference to the stock sheets, the amount of material that is on hand and the exact number of stoves that could be made from the available supply. This system extends throughout the entire plant, so that when an order is placed for a large number of stoves, a few minutes checking of the different stock sheets advises the superintendent or his chief clerk just what is required to fill the order. Steps are immediately taken on the receipt of an order to arrange the production of the foundry and the purchase of the necessary stock and other accessory supplies, so that no department is handicapped through delay in receiving materials.

MACHINING DEPARTMENT FOR SMALL STOVE PARTS.

The more important machines in the cutting department are a Brown-Boggs 8 ft. power squaring shear; a 42-in. double crank consolidated power press for body making and heavy formed work; one Michigan and one Excelsior power press; an automatic top grinding machine made by the Excelsior Tool Co.; a special vertical inside grinding machine for work on stove parts; and a number of smaller tools such as foot shears, harnd folders, and presses, together with all the other necessary shop equipment for the rapid and economic production of sheet metal operations. One section of the second floor is set apart for the nickeling of the numerous ornamental parts now found on nearly every make of cast iron or steel range or heater.

Nickeling and Polishing

The nickeling equipment is of the most modern type, a prominent feature being a Hanson and Van Winkle dynamo of 1,000 ampere capacity; all wiring is contained in conduits throughout. The polishing room, adjoining the nickeling department, contains 10 Hanson and Van Winkle polishing machines, driven from a shaft located below the floor; each machine is fitted with an exhaust head, and a Sheldon fan is employed to remove the dust from these machines. The blacking of the different cast iron stove parts is also performed on this floor, as is the wrapping and crating before going to the shipping department.

VIEW IN ONE OF THE MACHINE MOULDING SECTIONS.

Gas Stove Mounting

The entire third floor is reserved for the gas stove department; one section is provided with the necessary pipe threading machines, presses and drills required for the different parts and the main portion of the room is used for the mounting of the various makes of stoves. An interesting feature in connection with this department is the drilling of the small holes in the various gas burners by means of multiple drill heads, as many as 72 holes being drilled in one type of burner at a single setting. The presses and multiple drill heads were supplied by the Michigan Press Co. of Ypsilanti.

All finished material for all makes of gas stoves is kept on this floor, the operation of this department being governed by the checking system already referred to. Four concentration points on this floor govern the supply and distribution of all material—the sheet metal stock room, the rough castings department, the general stores department, and the finished material stores. Daily records are kept of stock and orders so as to avoid the possibility of misunderstanding between the heads of the different departments.

The average output of stoves, ranges and heaters is about 100 per day, while the number of gas stoves turned out each day ranges from 50 to 75. The japanning room is equipped with an oil burning oven, maintained at a heat of about 350 deg. F. The interior of many of the gas stove ovens are given a coat of aluminum, sprayed on.

Like most of the large metal working establishments in Canada, this plant has been engaged in the manufacture of shells, having been working on the 4.5 in. size for upwards of two years. The output to date has been upwards of 250,000 shells.

VIEW OF PART OF THE GAS STOVE MOUNTING DEPARTMENT.

Enamelling Department

The art of enamelling, or the fusion of quartz and chemical compounds to form a hard vitreous surface on metallic objects, either for the purpose of decoration or utility, is gradually assuming increased importance in the industrial developments of the country. Additional enterprise in this direction is the most recent departure of this firm.

The enamelling plant, located directly opposite the main offices, is of brick construction, 120 ft. by 60 ft., and is of single floor construction, with the exception of the front section of two floors, the upper one being used for chemical storage and decalcomania work. The ground floor is divided into three sections—one containing the smelting furnace and the grinding mills, a pickling department, containing acid baths for cleaning the sheet steel articles, and also a steam heated drying kiln, while the greater portion of the ground floor is reserved for the actual operations of enamelling the work.

Three oil-fired furnaces are installed, two being adapted for sheet work, while the third and largest is constructed to handle cast iron hollow ware. Of the two former, one is open hearth and the other muffled type. The fuel is kept in a 800-gal. tank adjacent to the building, and is supplied from the main 10,000-gal. reservoir provided for the operations of the furnaces in the shell machining department. Oil is delivered to the burners by means of a small centrifugal pump, and air for blast and combustion is supplied at a pressure of about 70 lbs. per sq. in. The other equipment of the shop consists of the various receptacles for holding the solutions and the necessary facilities for handling and transporting the work to and from the kilns and furnaces.

Preparing the Frit

The art of enamelling, like other processes of a similar nature, involves considerable knowledge of what are known as trade secrets, many of which are only attainable by actual experience and continual practice. The general features of the work, however, will be gathered from the following description:

The necessary compounds, such as the sedimentary rock and chemicals, are received in the form of shale or powder, and are first mixed and smelted in an oil-fired furnace, the proper proportions of the compound being determined by the particular formula in use. The furnace is divided into two sections—one reserved for colored and the other for white mixtures. The furnace is heated to about 1,600 deg. F., care being taken to avoid over-heating. When the heated mass of materials begins to bubble, the furnace is immediately tapped and the charge run out into a bath of cold water; instantaneous cooling is a very important factor, and to achieve this the frit, as the product is termed at this point, is allowed to flow out in a very fine stream and a current of cold water is played upon the molten substance as it falls into the bath, which is also kept cold by a continual overflow from the wooden tank beneath the pouring spouts. The sudden vitrifaction of the frit facilitates the operation of grinding to the desired degree of fineness, the calcined substance having a glassy appearance and being easily broken into smaller particles.

Grinding the Mixture

After the material is removed from the cooling bath, it is allowed to dry before being placed in the mills for grinding. In addition to the chemicals that are united in the fusing process, others are added preparatory to grinding. Two tumbling mills, 3 ft. dia. by 4 ft. long, and one about 2 ft. by 40 in. long, are provided for this purpose, the two larger being for wet mixtures and the smaller for dry mixtures. The mills are made with sheet steel bodies and cast iron ends, and are lined with a substantial layer of porcelain. The door is similarly lined, and when placed in position the inner wall coincides with the remainder of the cylinder, thus forming an undisturbed surface for the movement of the revolving mixture.

One of the very important requirements in connection with the preparation of the chemicals and various ingredients used in the art of enamelling is that every facility be adopted and the greatest care exercised to exclude the presence of foreign matter which would have a detrimental effect upon the ultimate results. The friction and impact required to grind any substance to powder entail the use of grinding mediums which must be much harder than the material being ground. Flint stones are generally used for the grinding of enamelling powders, as the wear upon them from the continual tumbling is imperceptible, and thus assures the powdered material being practically free from any substance other than those placed in the mill. Extreme care and cleanliness must be exercised in the preparation of the materials and their subsequent use in the enamelling process; and to eliminate trouble at a future stage of the work special attention is given to all these elementary factors.

After the charge in a mill has been ground to the desired grade of fineness, generally requiring from 5 to 6 hours, every particle of the powder, together

VIEW OF NICKEL PLATING DEPARTMENT SHOWING VATS AND DYNAMO.

TWO OF THE FURNACES IN THE ENAMELLING DEPARTMENT.

with the flint stones, is removed from the interior, and the cylinder is thoroughly cleansed, while every stone is brushed with a wire brush and washed before being again placed in the mill. This practice is not only adopted when the proportions of the different formulæ vary, but also when one having the exact proportions of the mixture, just previously ground, is to be placed in the mill. Strict adherence to this principle is necessary to guarantee a mixture corresponding to the specified formula; it also acts as a positive check on subsequent operations.

Enamelling Sheet Stock

A peculiar characteristic in the enamelling of metal is that the process is somewhat varied for sheet work and castings, due to the difference in the chemical reaction. For operations on sheet work the mixture is prepared in the form of a wet solution, into which the parts are dipped; while the process for castings requires the application of the enamel in a powdered state distributed evenly upon the surface of the work. The primary essential in the enamelling of sheet metal is the selection and preparation of the material.

After the sheet iron has been cut and formed into the shape desired, the pieces are thoroughly cleansed in an acid bath and then well washed in hot and cold water, being afterwards immersed in a special solution and again washed in water to destroy further action of the acids. All trace of moisture is entirely removed by placing the treated work in a drying kiln, after which it is ready to receive the ground coat. In the general run of sheet steel work that is subjected to the enamelling process, particularly the class of work that is handled in this plant, the entire surface of the work is treated with a ground coat, this invariably being of a dark blue color. The enamel is in the form of a creamy solution contained in galvanized sheet steel tanks, into which the work is dipped and swung with a peculiar movement so as to insure an evenly distributed coating over the complete surface of the work. This is a very important detail, and the girls employed become very expert in the manipulation of the different shapes and sizes they are called upon to handle.

Drying and Burning

After being arranged in rack trucks—the pieces being kept separate—they are moved into the drying kiln to remove all traces of moisture; when thoroughly dry, the work is ready for baking. Special facilities are provided at the front of the furnace for handling the work. The pieces are placed on bars provided with sharp prongs, so that only the points are in contact with the material; this method avoids serious marking of the under surface and also prevents distortion of the work. Several pieces are placed on this rack and the whole run into the furnace, which is kept at a temperature of between 1,500 and 1,600 deg. F.

Baking or burning, which constitutes the fusing of the enamel coating, occupies about one or two minutes, and when the work is taken out it is immediately removed and placed on a flat plate to retain the shape while cooling. When cold, the same sequence of operations is again followed for the succeeding coats. The general practice in this plant is to give the work one ground, one intermediate and one finishing coat; this gives a fairly flexible surface; a thicker enamel is liable to develop cracks.

For embossed work, such as lettering or ornamental designs, the plant is equipped with a spraying outfit, this being the only method that will insure equal distribution of the enamel solution. When work of this character is dipped the solution gathers about the raised impressions and destroys their prominence owing to the inability of the solution to drain freely from the irregular portions.

Process for Cast Iron

The method of enamelling cast iron differs to some extent from that used in coating sheet material. The application of the ground coat is accomplished in a similar manner, the piece being swabbed with a thin solution and then dried, after which the article is placed in the furnace and heated to a cherry red, when the work is removed from the fire chamber and sprinkled evenly over the entire surfact with finely powdered enamel and again placed in the furnace, allowing the powder to fuse and spread evenly over the surface; this process is continued until the desired coating is obtained. The surface of the iron must be perfectly clean and free from corrosion, as the chemical action of the rust will not allow the enamel to set properly, a blemish appearing wherever rusting has occurred.

In the preparation of the various formulæ the company have given special attention to those for cast iron hollow ware subjected to chemical reaction during the boiling or cooking of fruits and

SMELTING FURNACE AND GRINDING MILLS. NOTE TANK INTO WHICH MOLTEN FRIT IS RUN.

vegetables that contain a large percentage of acid. Enamel work of this character must withstand the severest acid test before it is permitted to leave the factory.

Ornamental Work

Floral and other ornamental designs for the decoration of signs, stove panels, etc., are included in the work of the enamelling department. Meyercord's process of enamel decalcomania is the method used in putting on the various designs; after being transferred to the previously enamelled surface, the articles are again baked in the furnace and the color design is burnt in and becomes part of the enamel coating.

The range of product manufactured by this firm includes wood burning cook stoves, cast iron and steel stoves and ranges for wood, coal and gas, and in addition specializes in numerous items of cast iron house and factory equipment, much of which is now being treated in the new enamelling department.

Owing to the semi-isolated position of the plant, special provision has been made for fire protection; in addition to a well trained fire-fighting force, the entire factory is equipped with a sprinkler system. Shop welfare and first aid departments are also features of the plant management. The executive consists of E. Panneton, managing director; J. A. St. Germain, secretary-treasurer; F. Lauer, general superintendent; and Chas. Watt, superintendent of the shell department.

CANADA'S NICKEL REFINING CAPACITY

IT was pointed out at the first annual meeting of the Commision of Conservation in 1910 that, although Canada was possessed of the richest portion of the world's supply of nickel, we were deriving only a comparatively small amount of benefit from it. The most expensive portion of the work of recovering nickel from the raw ore was done in other countries. This anomaly is now in course of being remedied. As the result of constant agitation and discussion we are likely to see by far the greater part of the work done in Canada.

The British American Nickel Corporation has under construction near Sudbury a new electrically-operated smelting refinery which will have a capacity of 2,500 tons of ore daily and a nickel production of 20,000,000 pounds per annum. The smelter will produce a matte carrying 80 per cent. copper and nickel, which will receive final treatment in the refinery.

The International Nickel Co. is constructing a new refinery at Port Colborne at a cost of $4,000,000, which will be in operation in a few months. The initial capacity will be 15,000,000 pounds of nickel per annum, but it can be expanded in a few years to produce 60,000,000 pounds. The new plant, according to the company, will be able to supply the needs of the whole British Empire.

TWENTY-FIRST ANNUAL MEETING OF NATIONAL FOUNDERS' ASSOCIATION

ON the occasion of its twenty-first annual meeting, held at the Hotel Astor, New York, recently, the National Founders' Association demonstrated as far as possible in a meeting of this nature the loyalty and patriotism of its members. A new high record was set for attendance, this event being largely influenced by the great amount of labor disturbance throughout the United States. The apprehension felt by the members regarding results likely to arise from the attitude of labor unions was strongly evidenced by the president, William H. Barr, who stated that national efficiency and prosperity rested upon that foundation of industrial equality and liberty known as the open shop, and he further insisted that in time of war the 8-hour day is an economic waste and a grave menace.

Increased Output With Reduced Labor

The question of maintaining normal production of castings despite reduced labor facilities was discussed to a large extent. The opinion was expressed that jobbing founders are not producing in excess of 50 per cent. of their capacity, and president Barr emphasized the patriotic duty of jobbing casting manufacturers to maintain their normal production in spite of the labor shortage.

The results obtained through the installation of moulding machines and similar labor-saving equipment were convincingly shown in a series of motion pictures taken in various progressive plants in the United States and Canada. Moulding, pouring and shaking-out work when performed with suitable equipment had yielded increased output up to four and fivefold, and in some of the shops shown the skilled labor had been replaced entirely by handymen. Piecework payment prevailed and combined with the increased output, had resulted in greatly enhanced wages. Operations at the following plants were shown by the pictures: King Sewing Maching Co., Buffalo; Buick foundry of the General Motors Co., Flint, Mich.; Eddy Valve Co., Waterford, Conn.; McClary Mfg. Co., London, Ont., and the Lumen Bearing Co., Buffalo. In connection with the latter plant it was stated that the employes are now averaging an output of 1,108 pounds of castings each, of an average weight of less than three pounds per casting.

Officers and Council

New officers of the N. F. A. are: President, William H. Barr, Lumen Bearing Co., Buffalo; Vice-President, Samuel L. Moore, Moore Bros. Co., Elizabeth, N.J.; Secretary, J. M. Taylor, Chicago; Commissioner, A. E. McClintock, Chicago.

The following members of the seventh district committee were chosen: George W. Watts, Canada Foundry Co., Ltd., Toronto, Ont.; A. R. Goldie, Goldie McCulloch Co., Ltd., Galt, Ont.; H. Cockshutt, Cockshutt Plow Co., Brantford, Ont.; J. C. Russell, John McDougall, Caledonian Iron Works Co., Ltd., Montreal, Que.; W. M. Gartshore, McClary Mfg. Co., London, Ont.

COAL MINING LEASES

COAL-MINING rights on Dominion lands are disposed of by the Dominion Government under leases, the provisions of which are so liberal as to afford the operator every encouragement. They do not, however, give any consideration to the relation of the coal seams, the order in which they should be worked to prevent waste, the quality of the coal in the several seams and the coal content in the leased areas. The result is that a tremendous tonnage of coal is wasted.

All other important coal-mining countries which dispose of coal-mining rights under a system of leasehold have found it necessary to prevent waste arising from the lessee sacrificing the public wealth for his private gain and waste due to injudicious mining. In Nova Scotia, Austria, Australia and Japan, and in the case of privately-owned coal lands in England, Scotland, and in certain portions of the United States, before a lease is granted or mining operations are begun, it is necessary for the applicant or the holder of a mining right to submit a scheme of intended operations to the proper authorities. To receive approval, this proposed method of mining must be such as to prevent wasteful mining, and, at the same time, provide for the safety of the miners. That the Dominion Government should take measures to prevent the waste under the present system of leasing needs no demonstration.

U. S ENGINEERS DISCUSS WAR TOPICS

WAR topics predominated at the convention of the American Society of Mechanical Engineers, recently held at the Engineering Society Building, 29 West 39th Street, New York, the engineers discussing the shipbuilding problem, the aircraft problem, the fuel problem, the agricultural problem, etc.

Methods were considered whereby the problem of fuel conservation will be met either by compelling coal consumers to execute such measures of economy as the authorities prescribe, or else by disseminating correct information regarding the mining and consumption of coal, accompanied by an appeal to the patriotism of the consumers.

Such subjects as expenses and costs, accident prevention, labor turnover expense, and the relation of industrial management to engineering, were discussed. Dr. John A. Brashear, past-president of the society and widely known in connection with the development of the modern telescope, addressed the members and their guests, taking for his subject "The Science of the Beautiful in Commonplace Things."

Honorary membership in the American Society of Mechanical Engineers was conferred upon Major-General George W. Goethals in recognition of his achievements in engineering, and Ex-President Taft gave an address on "The War's Call to Professional Men." These functions, which were held in the impressive auditorium of the engineers' building, were followed by a reception to the new president of the society, Mr. Charles T. Main.

ITALIAN MARKET FOR PIPE FITTINGS

A REPORT from the United States Consulate at Florence published in Commerce Reports for April 27, 1915, stated that the Italian market for pipe fittings was controlled by German and Swiss manufacturers and that fittings made by American manufacturers had been found unsatisfactory.

At the present time there is an urgent demand throughout Italy for fittings. Stocks of German and Swiss goods have been sold out, Great Britain requires its goods for its own use, and France seems to be unable to pick up the Italian trade. A good market is offered to American manufacturers if they will conform to local requirements. The principal requirement is that fittings must have right-hand threading of English standard. Even left-hand thread might be used if of English standard. The differences between English and American standard thread is shown in the following table:—

Size of pipe, in inches—	Threads per inch English	Threads per inch American
1/8	28	27
¼	19	18
3-5	19	18
½	14	14
¾	14	14
1	11	11½
1¼	11	11½
1½	11	11½
1¾	11	11½
2	11	11½
2½	11	8
3 to 6	11	8

These standards for pipe up to 2½ inches look so much alike that without actual counting and measurement careless employees are apt to get them mixed, with consequent cutting of threads or jamming of fittings. It must be said, however, that this market is accustomed to and wants fittings with English standard threading. This is true of most of Europe. American manufacturers who hope to compete with European manufacturers must make up their minds to this fact.

The American practice of threading sleeves at each end does not obtain here. Sleeves in Italy carry a right-hand thread through their length. Furthermore, this market uses quantities of bends, particularly 90 deg. bends, which seem to be no longer made in the United States. Before the war, these could be obtained in any desired quantity from German and Swiss manufacturers. At the present time there is a tremendous demand for wrought iron flanges, which seem to be unobtainable.

With one or two exceptions, the materials used in and the finish of American fittings are said to be markedly inferior to those of Swiss and German manufacture. It is claimed that roughly finished moulds are used in castings and a poor quality of iron employed, with the result that the finished product has numerous pits inside and out. These cause rough threads and rust. Swiss and German fittings are of better material, stronger, and of lighter weight. Owing to the use of better moulds in casting, fittings have smooth, even surfaces. As to splitting, the consulate has been told that they seldom split, whereas this is of frequent occurrence with American fittings.

Other complaints of American fittings are that those for pressure use have flat bands instead of the round bead wanted in this country; and that reducers, instead of carrying the same thickness of metal throughout in proportion to the diameter of the several openings, carry the same outside diameter, which, according to Italian taste, makes a bulky, ugly piece of work. This taste requires a careful finish and proportion in all metal work. Whether or not American work is as strong or stronger is not the question. The point is that work must be turned out to suit the market. Any American manufacturer willing to do this can get a hold on this market at the present time that will insure him a permanent outlet for his goods.

Fittings and pipes are not separately classified in Italian import statistics but are lumped with other manufactures of iron. Pipes of American manufacture are the best in this market and have commanded the trade for years. If care were taken with fittings, American fittings, helped by the reputation of American pipe, would soon have the same enviable position here.

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WELDING EQUIPMENT AT PANAMA

THE following description of welding plant and methods, published in a recent number of the **Canal Record**, indicates the completeness of detail with which this great undertaking is operated. It wil be noted that oxy-acetylene, oxy-hydrogen, and electricity are all utilized.

The acetylene generating and compressing plant consists of two Navy-type acetylene generators, each having a capacity of 200 pounds of calcium carbide at a single filling and generating 200 cubic feet of acetylene gas per hour. This outfit includes a 100-cubic foot gasometer, a purifying and drying apparatus, Chatillon and Osgood weight scales, and an acetone charging apparatus, a gas meter, a 3-stage compressor, and a tank charging rack, with especially prepared cylinders to contain compressed acetylene gas.

The special acetylene cylinders are used for supplying gas for coast and range lights for the Marine Division, the Republic of Panama, Nicaragua, and Costa Rica. There also are aceylene gas cylinders used for welding and cutting purposes at Balboa, Cristobal, Paraiso, and other points along the Canal Zone. This plant supplies also gas for tanks for lighting purposes on automobiles and motorcycles.

There are about 18,000 pounds of residue per month which is a by-product in the manufacture of acetylene gas. It is turned over to the Balboa storehouse and is used for fertilizer and whitewashing purposes on the Canal Zone.

Acetylene gas manufactured in this plant during the year ending June 30, 1917, amounted to 606.649 cubic feet.

The oxygen and oxy-hydragen generating and compressing plant consists of a 50-horsepower motor-generator set, a 30-horsepower motor-generator set, 45 electrolytic cells, two gas meters, a 100-ucbic foot oxygen gasometer, a 100-cubic foot hydrogen gasometer, a gas testing apparatus, a gasoline apparatus, three retorts, three scrubbers, a water distilling outfit, hydrogen compressor, two oxygen compressors, with cylinders to contain compressed hydrogen.

Oxygen is the combustion agent used in oxy-acetylene and oxy-hydrogen welding and cutting. It is used by the chemical laboratory and Ancon Hospital for medical purposes. It is manufactured in building No. 16, Balboa Shops, by two methods—the electrolysis of water process and the chemical process.

The electrdlytic method of manufacturing oxygen and hydrogen is by decomposing water to which caustic soda has been added. The operation is carried out by means of electricity, the water being divided into its elements (H_2O) and the two gases collected separately and conveyed to gasometers. The electrolytic outfit is running 24 hours of oxygen and 8,000 cubic feet of hydroper day, producing about 4,000 cubic feet of oxygen and 8,000 cubic feet of hydrogen per day.

The chemical process of manufacturing oxygen is by mixing potassium chlorate with about one-eighth of its weight of maganese dioxide. This is put into air-tight retorts and heated by a gasoline apparatus until the oxygen is driven out and into the oxygen gasometer; the residue remaining in the retorts is taken out and shipped to the United States, where it is sold . If necessary 4,500 cubic feet of oxygen can be produced in 24 hours by the chemical process, but on account of its being much more expensive than the electrolytic process the chemical method is used only when enough oxygen can not be secured by the electrolytic method to carry on the work. Oxygen manufactured at this plant during the year ending June 30, 1917, amounted to 1,099,378 cubic feet.

The oxy-acetylene process is used in cutting and welding work in general, such as cutting steel and wrought iron plates, rivets, cutting out rivet holes, cutting by lengths; to mitre or bevel any section of steamships, barges, dredges, dipper sticks, spuds, buckets, impellers, and iron and steel scrap; welding cast iron, steel, aluminum, brass, copper, and malleable iron, as in welding together broken ship machinery, foundry castings, cracked cylinders, propellers, dredge buckets, spuds, dippers, pipe, and shop machinery.

Oxy-hydrogen is also used at Balboa Shops for cutting, but not as extensively as the oxy-acetylene process. Oxygen removes carbon from gas engine cylinders in a few minutes and more effectively than any other method.

Electric arc welding outfits used by the Mechanical Division are portable machines, one being stationed at Balboa Shops and one at Christobal Shops. The equipment used for this line of work is especially suitable for marine and locomotive boiler work, heavy steel castings, plate work, patches, and heavy frame work.

Review of the Past Year's Iron, Steel, and Metal Markets

Staff Article

The year 1917 *has been the most prosperous in the history of the iron and steel trade in Canada, surpassing the immediately previous best twelve months both in regard to tonnage output and price. The most confirmed optimist would hardly have anticipated such developments as have taken place during the year. The war has, of course, been responsible for the increased activity through its enormous demand for steel for munitions and ship construction, and indications point to a continuance of this activity during* 1918.

IN a general survey of the iron and steel situation in Canada, it is necessary to consider conditions in the United States as the two markets are so closely allied, particularly owing to the fact that this year the latter entered the war on the side of the Allies. The participation of the United States in the war changed considerably the aspect of the situation when their interests became common with the Allies. Association between the steel trade in the States and Canada became closer, to the mutual benefit of both countries. Very important developments have taken place in the States and considerable space must be devoted to these features as they have had an important effect upon the situation in Canada. Among these developments were the fixing of maximum prices of iron and steel products, and the embargo placed on the export of the latter. Another feature has been the steady advance in prices.

Improvement in the physical condition of Canadian steel plants has taken place during the year. In the time of bad trade there was a disposition to spend as little money as possible on repairs and improvements except when absolutely necessary. This condition has been to a large extent corrected, the cost being paid for out of earnings. The improvements have thus been made without increasing capital charges. During the past three years, important extensions have been made at all the steel plants and output has been considerably increased. These plant extensions have also for the most part been paid for out of earnings. This is an important feature to consider for not only have the plants been improved physically and made more efficient, but the capacities have been increased and earning power is consequently greater. All this has been achieved without increasing capital charges.

Operating Conditions

Operating conditions have not been entirely satisfactory this year. There has been a scarcity of suitable labor for one thing, while some concerns have been handicapped by a shortage of raw materials. For the first three months the mills in Ontario were handicapped through not being able to get full coke supplies on account of the freight congestion on the railways. This trouble eventually was eliminated but the mills got behind on their orders. The mills in Nova Scotia have not been troubled on this account as they have their own coke ovens. A shortage of coal has also affected operations.

During the summer, little complaint was heard regarding shortage of raw materials, but in the fall an acute situation developed in the coke market in the States which adversely affected Canadian consumers. The shortage of coke resulted in a number of blast furnaces being banked in the States which threatened to curtail the output of steel. The freight congestion on the American railways was the principal cause of the trouble although scarcity of labor at the mines and also at the ovens had something to do with it. The severe weather which set in during the early part of December further handicapped the railroads and also operations at the ovens. Drastic measures to relieve the situation are inevitable before conditions can become anything like normal.

Steel Production

The table which is given elsewhere in this issue, compiled by the Mines Branch of the Department of Mines, Ottawa, shows that there was an increase in output of both pig iron and steel during the first nine months of this year over the corresponding period of 1916. The figures also show the imports of iron and steel which are particularly interesting in view of the embargo on these materials from the United States.

The total production of steel ingots and direct castings during the first nine months was 1,265,183 short tons, as against 911,054 tons during the first nine months of 1916. The average monthly production during the first nine months of 1917 was 140,576 tons as against an average monthly production throughout 1916 of 106,268 tons.

The production of steel in electric furnaces, included above, was 30.960 tons during the first nine months of 1917. The production of steel in electric furnaces in September was over 5,000 tons or at the rate of over 60,000 tons per annum.

Electric Furnace Feature

The electric furnace is becoming more popular in steel plants, particularly where electric power is cheap, and constitutes perhaps the most interesting development of the iron and steel trade in recent years. Improvements in design are continually being made with a view to increased efficiency.

An electric furnace installation of considerable size was placed in operation in Toronto this summer. The units installed in Canada so far are mostly of the Heroult type. There are electric furnaces in operation at Toronto, Welland, Montreal, Collingwood, Belleville, Orillia. An electric furnace installation is contemplated at Port Moody, B.C., while there is also a small unit in Toronto producing steel from ore fines and flue dust.

Pig Iron Production

The table compiled by the Mines Branch, Department of Mines, Ottawa, gives the complete returns of the pig iron production for the first nine months of this year and also for 1916. These figures also show an increase in pig iron production for the above mentioned period. The total production of pig iron during the first nine months of the present year was 895,307 short tons as against 844,717 short tons during the first nine months of 1916. The average monthly production throughout 1916 was 97,438 tons, whereas in 1917 the average was about 99,478 tons, representing a slight increase which may be considered satisfactory in view of the difficulty that was experienced in the first three months of the year in obtaining coke, etc., owing to the tie up on the railways, which affected principally the furnaces in Ontario. The exports of pig iron, short tons, in 1916, averaged 1,942 tons monthly and for nine months of 1917 the average was 1,135. In contrast with this decrease, imports increased, the monthly average in 1916 being 4,919 tons and over nine months of the current year it was 5,982 tons.

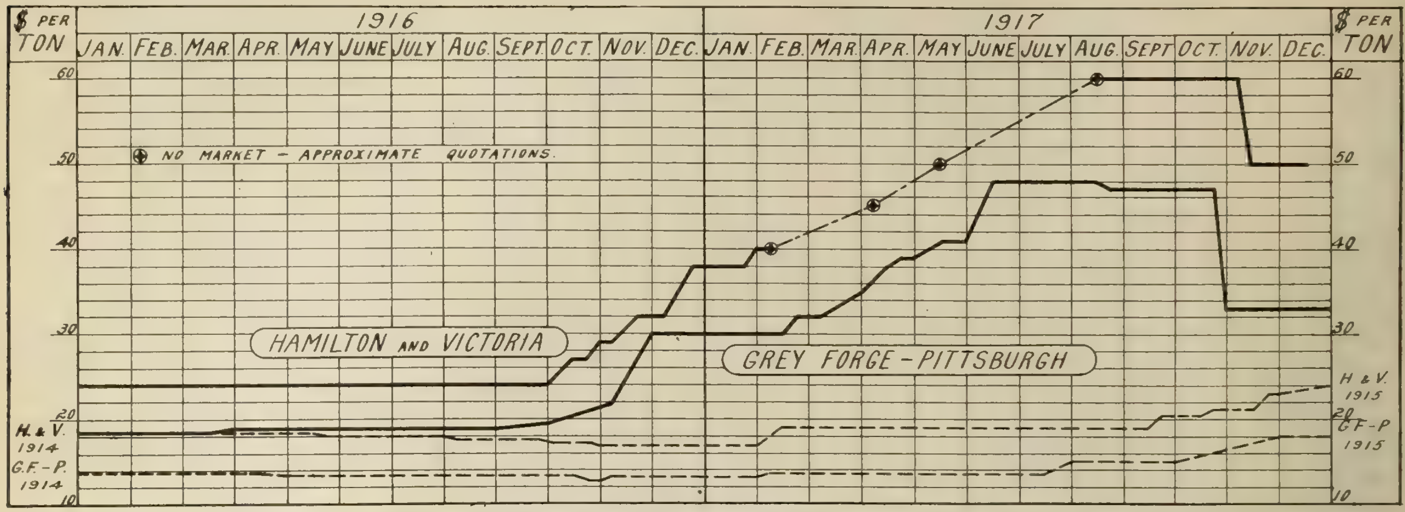
Furnaces were in blast at Sydney and North Sydney, N.S.; Hamilton, Port Colborne, Sault Ste. Marie, and Deseronto, Ont. Small quantities of pig iron were also produced in electric furnaces from scrap steel at Orillia, Collingwood, St. Catharines, Toronto, and at Montreal. The total quantity of pig iron thus produced in electric furnaces during the nine months was 9,983 short tons.

Prices of pig iron have been increasing steadily all the year and a record has been made; the highest price being $60 per ton. The heavy demand is partly the reason for this, with the furnaces for several months behind on deliveries. The most important producer of foundry iron for the open market has been the furnace at Port Colborne, Ont., the others having been for the most part making pig iron for the steel works. On this account there has been a shortage of foundry iron, which still exists. The high cost of coke has been an important factor in the pig iron situation and has been largely responsible for the continued advances. The fixing of pig iron prices in the States has not affected the Canadian market to any great extent and the opinion is held in the trade that prices of domestic iron will not decline much further for some time, partly on account of the embargo and also because of the sold-up condition of the furnaces.

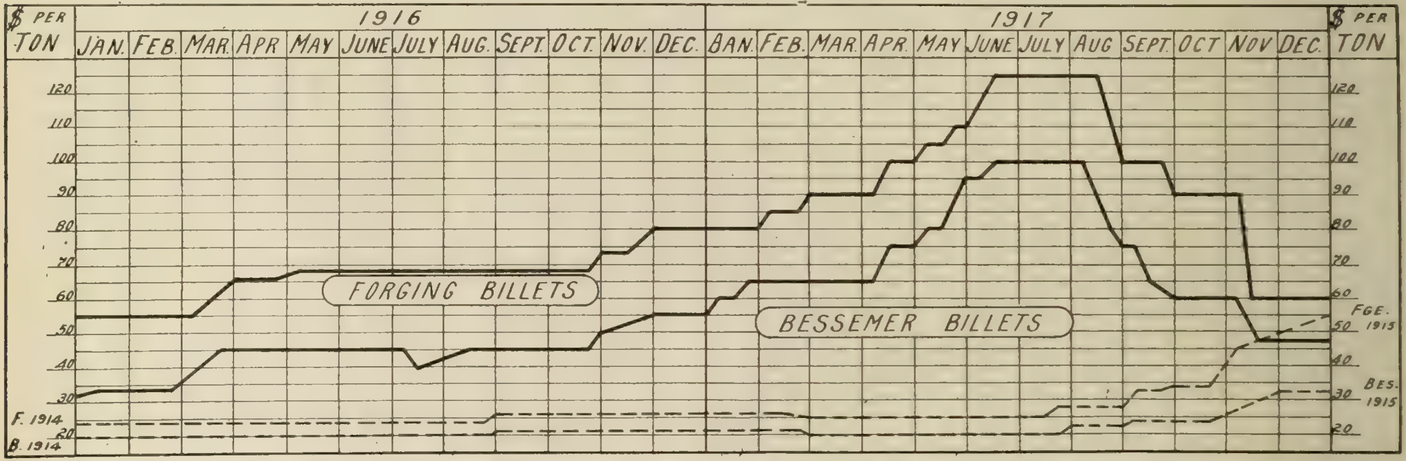
Production Has Increased

The extraordinary demand for steel for munitions was the principal reason for the great activity in the steel industry during the past two years or more. The urgency of the demand made it necessary to increase production and the steel concerns in Canada without exception responded to the call and extended their plants. A large percentage of these extensions was completed last year, therefore the producing capacity of steel has been higher in the past twelve months, which accounts for the increases shown in the tables. Further plant improvements are under way at the mills so that the producing capacity may be said to be still increasing. There is little doubt that full advantage will be taken of this situation and continued prosperity seems assured for the steel companies while the war lasts.

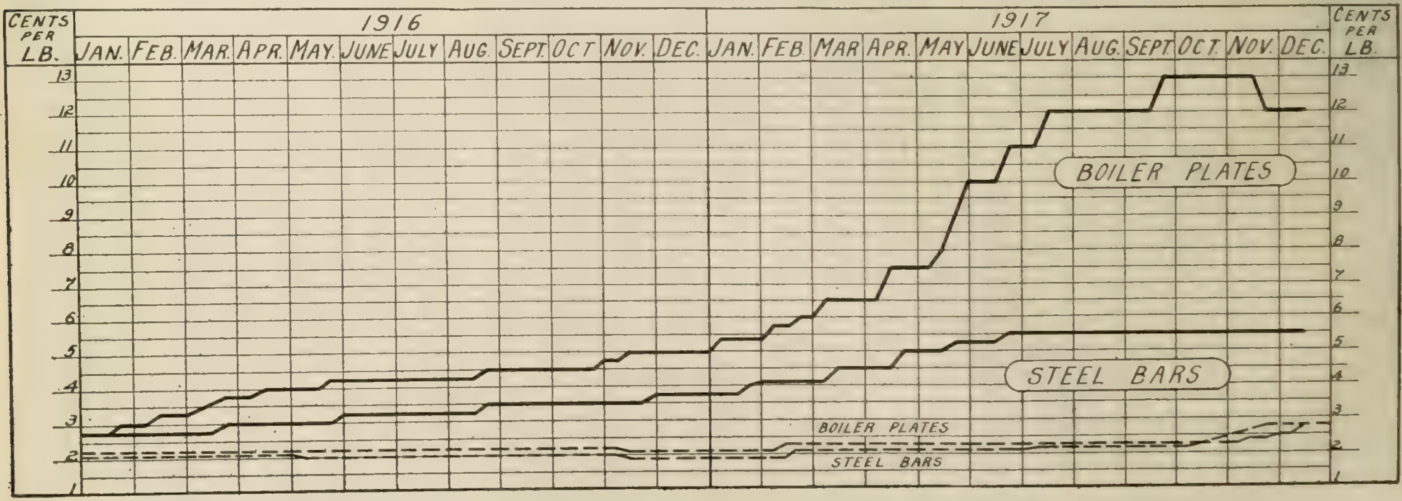
In view of the shortage of steel and increasing demand, Canadian mills will



PRICE FLUCTUATIONS OF PIG IRON DURING 1914-1915-1916-1917.

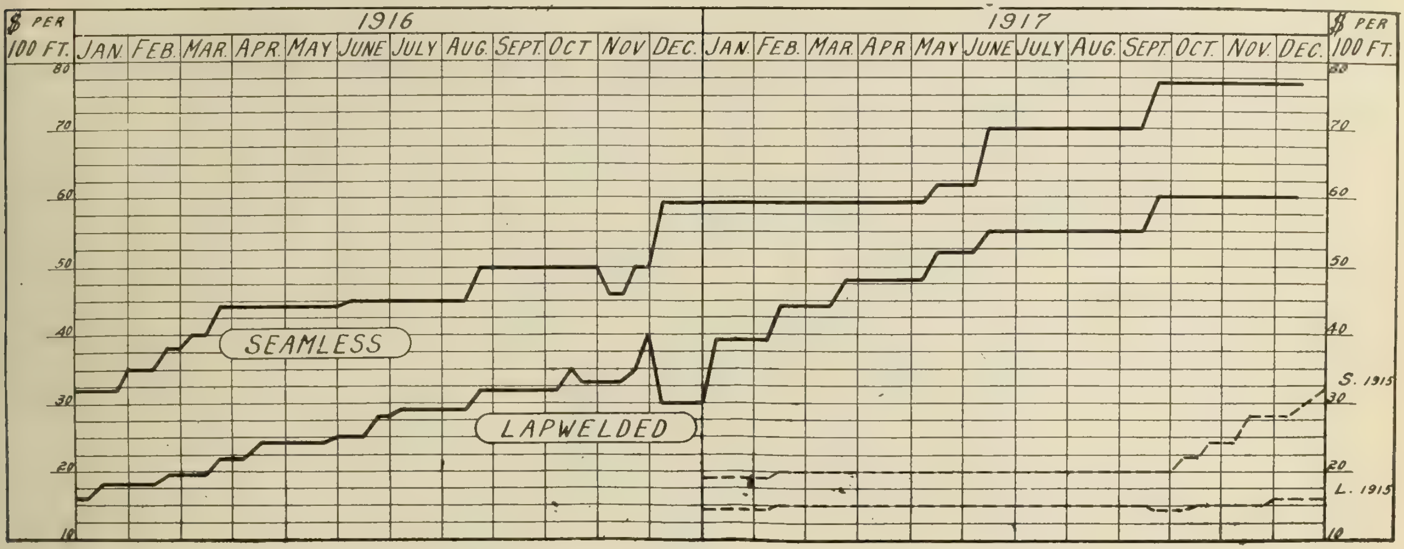


PRICE FLUCTUATIONS OF FORGING AND BESSEMER BILLETS DURING 1914-1915-1916-1917.



PRICE FLUCTUATIONS OF BOILER PLATE (¼ TO ½-INCH) AND STEEL BARS DURING 1914-1915-1916-1917.

be able to participate in conjunction with those in the United States. While it is true that munitions orders have been considerably reduced in Canada, there is still a comparatively large tonnage going into shell. An outlet for the tonnage not required for shell in Canada will be found, so the decline in munitions orders should not result in decreased output. The Dominion Government has arranged credits for munitions to cover the manufacture of 6-inch, 4.5-inch, and shrapnel, which will keep the firms engaged upon their production employed until next May. As a result, a considerable amount of business for the steel mills is assured for at least the first quarter of 1918.



PRICE FLUCTUATIONS PER 100 FEET OF 3½-INCH SEAMLESS AND LAPWELDED BOILER-TUBES DURING 1914-1915-1916-1917.

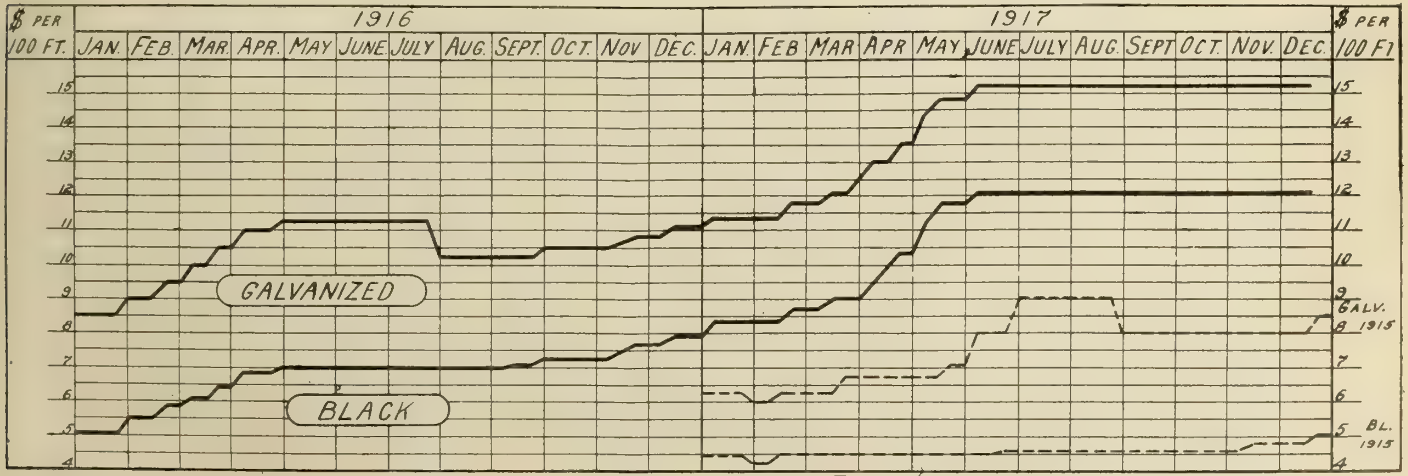
As the placing of further shell contracts depends upon the ability of the Dominion Government to finance them, it is unlikely that this industry will be as active in the future as it has been in the past. A strenuous effort will be made by the Government to raise funds, but as foodstuffs and other war supplies have also to be financed only a percentage of the total amount can be expended on munitions. This question has a direct bearing on the steel business which will benefit to a greater or less degree according to the sum set apart for the purpose. However, as already intimated, the surplus of steel not required for shell will doubtless be used in the manufacture of other products, such as rails, bars, shapes, wire and wire products, bolts, rivets, etc.

A considerable export business has grown up since the war started, and Canadian steel products of various kinds are now being shipped to different parts of the world. This export business would doubtless have attained bigger dimensions but for the shortage of ocean tonnage. However, orders have come from unexpected quarters and the result so far must be gratifying to the concerns engaged in it. How long it will last is uncertain, but the experience gained and connections made will be helpful after the war.

Unfortunately this development received a setback when the Dominion Government placed an embargo on the exportation of steel products except when destined for Great Britain or British Possessions. It is not unlikely that the embargo will be extended to include British Possessions on account of the acute shortage of steel which developed during the latter part of the year.

High Prices Prevailed

The high prices of steel which have prevailed throughout the year have been beneficial to the mills, while recent developments, in the form of an embargo, have also been favorable to them. Although operating costs have gone up, steel prices have advanced more in proportion and the mills have got the benefit. For the past three or four months there has been much excitement in the steel industry over the question of prices, which has been debated from every angle. For some weeks prior to the announcement of fixed prices at Washington it was predicted that there would be a general recession of values and there was very little private buying, except to fill urgent needs, in anticipation of lower prices. The steel market was very unsettled and although prices on the more important steel products have been fixed it cannot be said that the situation is much easier. The much discussed one-price-for-all policy was eventually adopt-



PRICE FLUCTUATIONS OF ONE-INCH WROUGHT IRON BUTT-WELDED PIPE DURING 1914-1915-1916-1917.

ed, thus putting the U. S. Government, the Allies, and domestic consumers all on the same buying basis.

That was all right as far as the U. S. was concerned, but it eventually transpired that steel for Canadian consumption was not affected by this policy. In other words Canadian consumers have had to pay on such steel as they imported from the States prices which were current before the agreed-upon prices were announced. How long this situation will continue is difficult to say as the mills in the U. S. have so much Government business on hand, and also in view of the fact that private consumers have considerable difficulty in getting material.

Steel and Iron

Although in comparatively few instances have there been any price recessions, and these have been entirely on imported material, it may be that when the mills have worked off the greater part of their unfilled tonnage booked at the high prices they may feel more inclined to accept business on the Government schedule. There is, however, the question of supply and demand to be taken into consideration, which will probably tend to stiffen prices in spite of Government regulations. The above remarks apply for the most part to conditions across the line, but have to be considered as conditions there affect steel products imported into Canada such as plates, sheets, billets, etc.

Take boiler plates as an instance. At the beginning of this year, ¼ to ½ in. plates were quoted at 5c per lb. Before July was over the price had more than doubled, being 12c, eventually reaching 13c. In November the price on plates in the States was fixed at 3¼c, but the price on the Canadian market for this material is now 12c per lb. Steel bars early in the year were quoted at 3¾c, eventually advancing to 5½c, which price still rules in spite of the fact that the fixed price in the States for this material is $2.90 per cwt. or a shade under 3c per lb.

The lighter gauges of black sheets and galvanized sheets are the only materials that have declined to an appreciable extent; No. 28 gauge black being now $8.50 whereas the top price was $11 per cwt. Boiler tubes advanced steadily until early in the fall when the crest was reached; they have been stationary since. Wrought pipe advanced steadily until early in July, but has been stationary ever since. Billets, open-hearth and Bessemer were quoted in Pittsburgh at $55 a ton in January. They eventually advanced to $100 a ton, reaching that point in June when forging billets were $125 a ton. This was the high water mark. Prices began to decline when the fixed-price schedule was announced, and they gradually worked down to the lower level that obtained early in the year. Bessemer and open hearth billets are now $47.50, and forging billets $60 a ton.

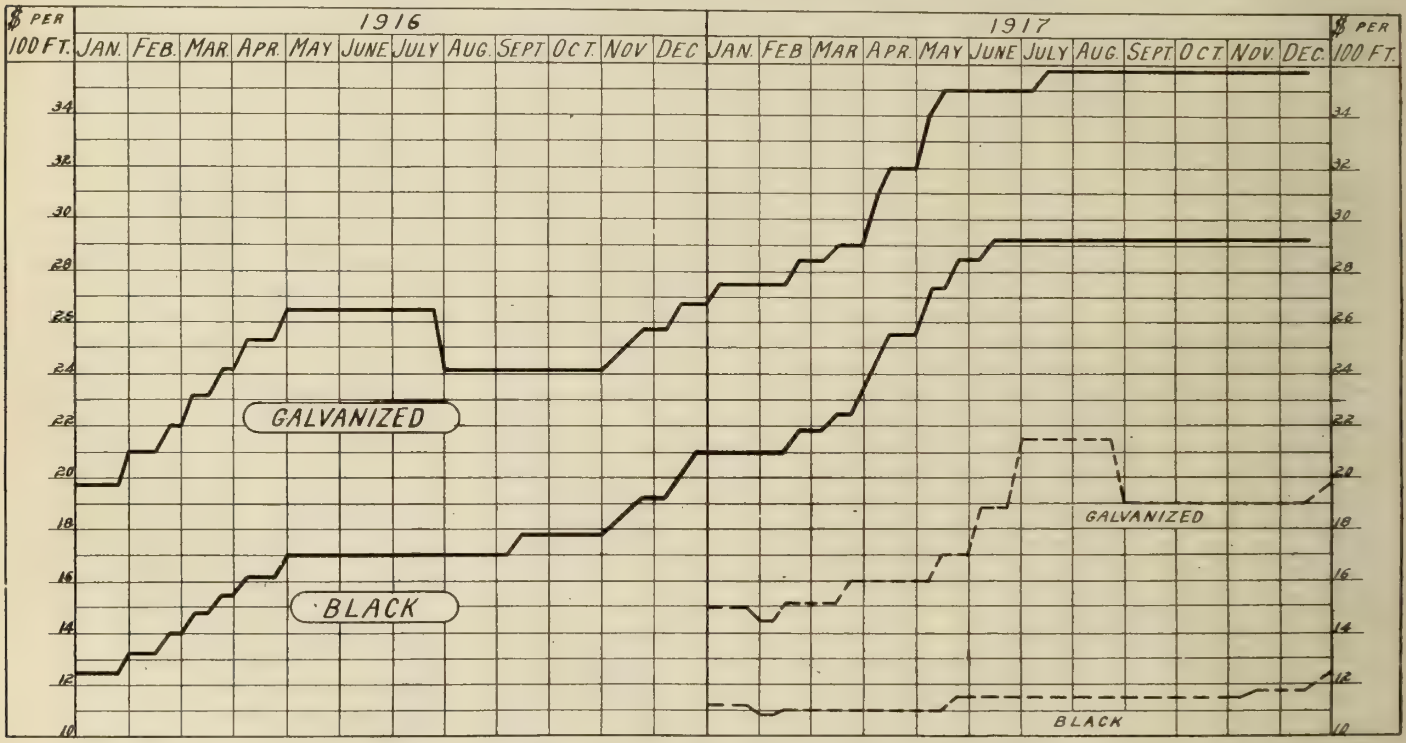
These figures cover the more important steel products and serve to show the peculiar situation that has prevailed during the year, and still exists. The outlook in regard to prices is decidedly obscure and it is impossible to say what will develop except that indications point to their continuance on a high level owing to the big demand for steel, and the unusual conditions prevailing in the market on both sides of the line.

Steel Prices As Fixed

It may be of interest at this juncture to quote the steel prices fixed by the War Industries Board at Washington. These prices serve to indicate what may be the trend in the future although they have not yet materially affected the situation in Canada. The agreed-upon prices are as follows and are subject to revision January 1, 1918. Iron ore, basis lower lake ports, price agreed upon $5.05 gross ton, no change. Coke, Connellsville, price agreed upon $6 net ton, recent price $16 a ton, a reduction of 62.5 per cent. Steel plates, basis Chicago and Pittsburgh, price agreed upon $3.25 per cwt., recent price $11 per cwt., a reduction of 70.5 per cent. Pig iron, price agreed upon $33 gross ton; recent price $58 gross ton, a reduction of 43.1 per cent. Steel bars, Pittsburgh and Chicago basis, price agreed upon $2.90 per cwt., recent price, $5.50 per cwt., a reduction of 47.3 per cent. Steel shapes, basis Chicago and Pittsburgh, price agreed upon $3 per cwt., recent price $6 per cwt., a reduction of 50 per cent.

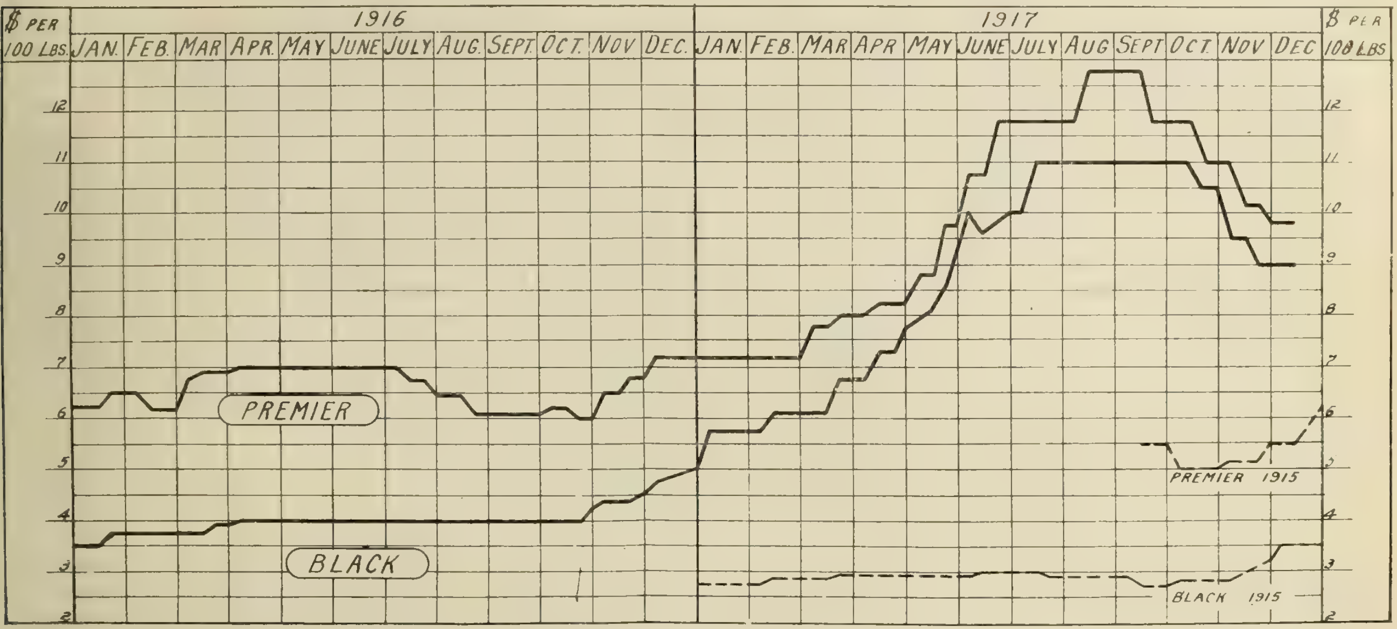
Shortly after the above prices were given out, a further list was issued by the Board which includes the following. —Those with Pittsburgh as base are· Steel bars (3 to 5 in.), $3.25 per 100 lbs.; steel bars (5 to 8 in.), $3.50; steel bars (8 to 10 in.), $3.75; steel bars, (over 10 inch), $4; skelp (grooved), $2.90; skelp (universal), $3.15; (sheared), $3.25. Blooms and billets, 4 by 4 in. and larger are now $47.50 gross ton; billets under 4 by 4 in. are $57; slabs $50; wire rods and sheet bars, $57, Pittsburgh and Youngstown bases. The prices will apply to private as well as to Government contracts.

The price of billets, fixed at $47.50, represents a reduction from the current



PRICE FLUCTUATIONS OF 2-INCH LAPWELDED WROUGHT IRON PIPE DURING 1914-1915-1916-1917.

market price of about $22.50 a ton; billets at $51, a reduction of from $29 to $44 a ton, and wire rods fixed at $57 a reduction of $33 a ton. Soon after the above schedule was issued, prices were fixed on a large number of other steel products and pig iron differentials were also settled. All these prices come up for revision early in January but from what can be heard it is unlikely that there will be any important changes.



PRICE FLUCTUATIONS OF GALVANIZED (PREMIER) AND BLACK SHEETS (28-GAUGE) DURING 1914-1915-1916-1917.

Embargo Situation

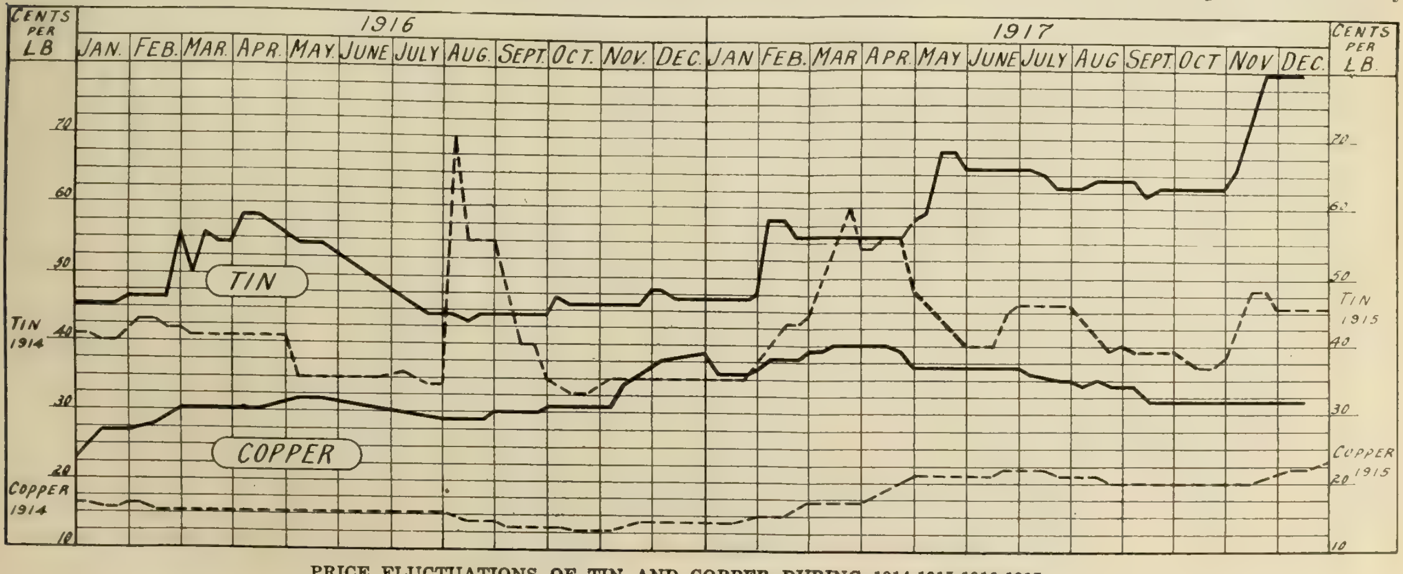
Owing to the necessity of conserving the supply of steel for war purposes, the United States Government, a few months ago, prohibited the export of steel except under license. Not only have prices been regulated by the Government, but the entire output of the mills will be supervised by the Priority Board, who will see that the U. S. Government and Allies have all the steel that is required for war purposes, and then allot what is left for commercial purposes.

In view of the large tonnage required for war purposes it will be a difficult matter to meet the demands of the ordinary consumer to the full extent of his requirements. This being the case, it is unlikely that the embargo placed on steel exports from the States will be modified to a greater extent than has already been done, although some leniency may be shown in the interpretation of the clause for war purposes or contributory thereto. In any event, consumers not working on war contracts are bound to suffer and manufacturing operations will be restricted. This is the most serious feature of the whole situation for those concerns using material such as can only be obtained from the States. Manufacturers who use domestic material will not be inconvenienced, except perhaps by some delay in deliveries, which can be overcome by judicious purchasing.

It is understood that the fixed prices do not apply on export business. This may be so for the time being, as the mills are not booking orders at the new prices, because they have no steel to deliver except on high-priced contracts. All new contracts will, of course, be subject to investigation by the Priority Board. The embargo also tends to neutralize the effect of the agreed-upon prices, and at the present time there is no indication of a general recession in the latter.

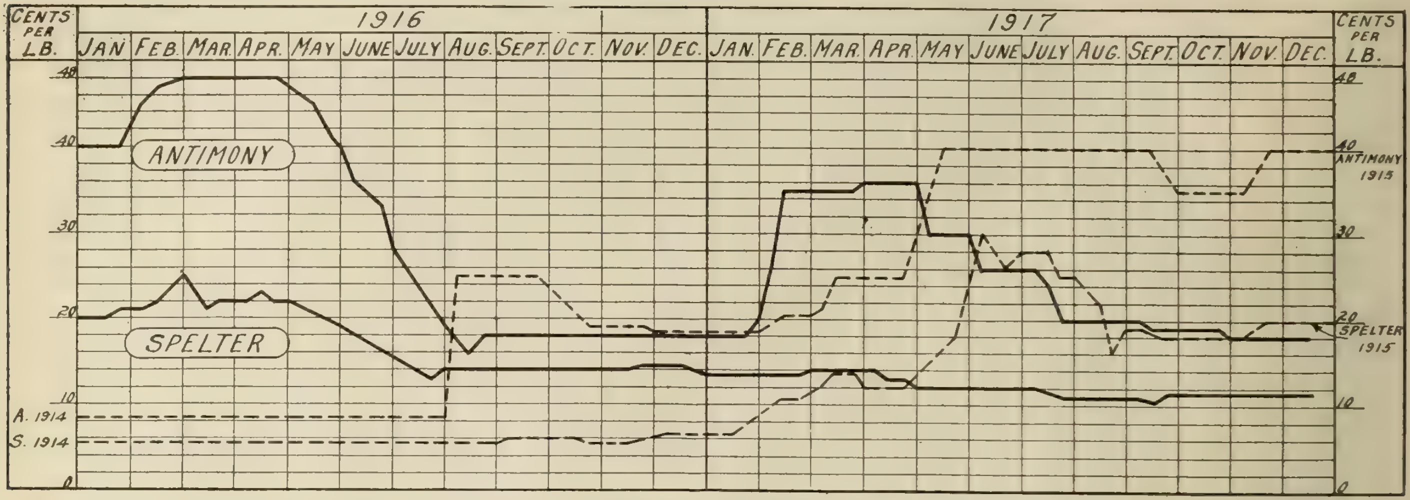
The embargo does not affect steel required for war contracts, shipbuilding and railroad betterment or equipment, and, therefore, will only be a hardship for consumers not working on war orders. This feature, however, is sufficiently serious to affect the general public, as a shortage of many articles made of iron and steel for every-day purposes will likely ensue. The embargo cannot help but restrict manufacturing operations in many plants, but nothing can be done to materially improve the situation as war work must not be held back.

It would appear that the embargo will benefit Canadian mills by eliminating competition in such products as they



PRICE FLUCTUATIONS OF TIN AND COPPER DURING 1914-1915-1916-1917.

manufacture. It is apparently having a tendency to keep prices up, which is also favorable to the domestic steel industry. It is believed in the trade that prices will remain more or less stationary for an indefinite period and that the ultimate downward movement will be gradual.



PRICE FLUCTUATIONS OF ANTIMONY AND SPELTER DURING 1914-1915-1916-1917.

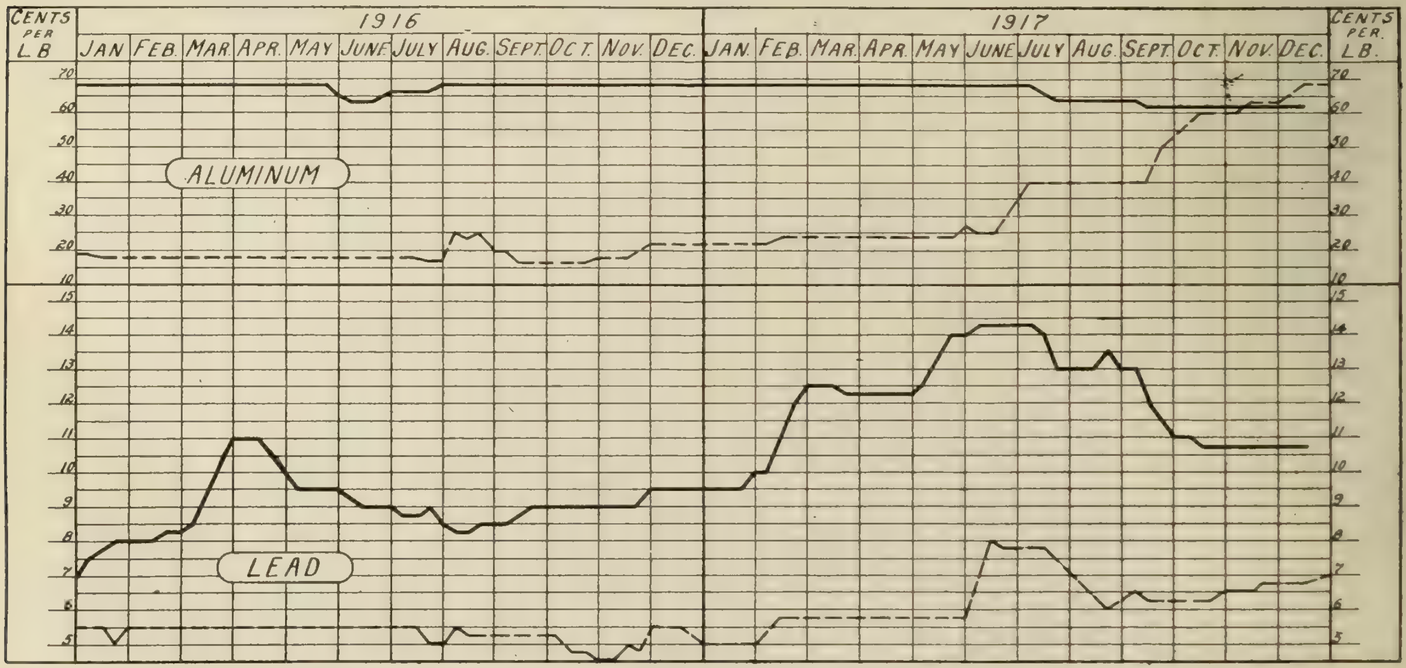
Future Prospects

What the future holds for the steel industry in Canada is a difficult question to answer. For the duration of the war there will likely be no material change in the situation. While the war lasts there will be an enormous demand for steel and the mills in Canada and the States will be kept operating at capacity. What the demand will be after the war is problematical. It has been asserted that the demand for steel during the reconstruction period in Europe will be such that the mills on this side will have all the business they can take care of. Against this it must be remembered that the mills in Great Britain and France will then be in a position to supply a large tonnage of steel for reconstruction and they will not have to rely upon the United States to the same extent as they do now.

It is generally conceded that there will be a period of depression in Canada, as in other countries, after the war and with it a falling off in the demand for steel. While admitting that this may be the case, the Canadian steel concerns were never in better shape to meet a period of dull trade, so there is little fear of trouble in this respect. The question as to whether our steel companies can participate in export trade after the war is also a difficult one to answer.

The main point is, can they compete with the mills of the United States? At present this does not appear possible. In the past, they have not been able, so it is difficult to see how they can succeed in the future, under normal conditions. The U. S. mills have considerably increased their producing capacity, which under normal conditions would tend to lower prices, based on the law of supply and demand. It is not unlikely that as a result, they would, as has been done in the past, cut prices on export orders, thus heading off competition. Under such conditions as these Canadian mills would be handicapped in export business as it is doubtful if they could come down to American prices.

Canadian steel mills are not at the present time able to compete with mills in the States in producing a number of steel products, principally plates and structural shapes, which eliminates them from much profitable business, both domestic and export. It is also doubtful if they can compete in many other lines as their production costs are higher. If legislation were enacted by the Dominion Government to increase the tariffs on steel products, it would benefit Canadian mills for domestic trade. Canadian steel companies are now financial-



PRICE FLUCTUATIONS OF ALUMINUM AND LEAD DURING 1914-1915-1916-1917.

ly able to develop their trade connections by manufacturing new lines and something may yet be done to develop the industry. The producing capacity having been increased, the mills will have little difficulty in filling any business that can be obtained. The prospects for trade in the future in spite of keen competition are without doubt better than in the past.

NON-FERROUS METALS SITUATION

THE outstanding feature in the non-ferrous metal markets has been the entry of the United States into the world war, this resulting not only in increased consumption but also bringing all markets under the control of the Government there. It was, however, only during the latter part of the year that the Government stepped in and asserted its authority, therefore, the real benefit of this action is only just being felt and incidentally appreciated. As a result of this move prices have a lower tendency, speculation has been almost entirely eliminated and trading conditions have improved. Generally speaking, the markets have been steadier this year than last. There have, of course, been fluctuations in prices, but the up and down movements have as a rule been less violent. The metal trade has become more accustomed to war time conditions and consequently the situation has been under better control. An exception may perhaps be made in the case of tin, but this market is controlled by the British Government and has been recently seriously affected by war time conditions.

Production which has probably now reached its maximum for all metals is being readily absorbed, supply and demand being now fairly equal. In the case of spelter, however, the market has suffered from over production, resulting in a steady decline in prices. The situation as regards output and consumption of all metals is more stable than in the preceding twelve months. There have been shortages of metals at different times, of course, for varying periods, but in each case the situation has been relieved.

U.S. Government Requirements

Not long after the United States entered the war, there was a general impression that the Government there would ultimately take a hand in the situation to ensure a sufficient supply of metals for its needs. A close investigation of the industry both as to production and prices was made by competent officials and eventually a policy was decided upon. Before any direct action was taken, however, the U.S. Government purchased metals at its own prices, which were considerably below the market quotations current at the time. Take as an instance, copper. The Government purchased a considerable amount of this metal in the spring at 16½c per lb., at which time the market price in its home market was about 34c. Again in July the U.S. Government paid 25c when the regular price was still over 30c per pound. The same policy was adopted in regard to other metals. This was sufficient indication as to what would ultimately develop and as a result prices became easier and declined steadily.

At the present time, the price of copper is fixed and supplies are being distributed by a board appointed for the purpose. An announcement is expected any day now covering fixed prices on lead and spelter and possibly aluminum, while a revision of copper prices may be made. The supply of tin being almost altogether controlled by the British Government cannot be regulated as to prices by the American authorities. Antimony is in much the same position as tin as it is not produced in the United States.

Canadian Metal Situation

The situation in Canada has been dominated by the conditions prevailing across the line. The greater part of the copper, lead and spelter used in Canada comes from the States and prices here consequently are regulated by those prevailing there. Although tin and antimony are not produced in the U.S., prices of these metals in Canada are practically regulated by the New York quotations. New York is thus generally spoken of as being the primary market. To understand the metal situation in Canada it is necessary to follow closely developments in the United States, for conditions existing there are usually reflected in the Dominion.

Canada still relies largely on the States for supplies of metals in spite of the fact that considerable quantities of copper, lead and spelter are mined within her borders, but as they have to be sent to the States to be refined, the market for these metals is practically controlled in the States. Satisfactory progress is, however, being made at Trail, B.C., where the Consolidated Mining & Smelting Co. have built a large refinery. The production at Trail is 360 tons of copper, 1,700 tons of lead and 1,200 tons of zinc per month. Considering that this is a new Canadian industry, so to speak, the results are most gratifying.

Copper

There has been no lack of interest in the copper market this year and the red metal continues in the front rank of importance for the manufacture of munitions and other war supplies. The demand for copper has been exceptional, but at no time has it been beyond the capacity of the refineries, except during the strike period. Strikes at the mines in July, which lasted for several weeks, created considerable anxiety in official circles and cut down production, creating an acute shortage for a time. The evil effects of the strikes still remain, but it is understood that there is now sufficient supply on hand to take care of all requirements. Mine and smelter production of copper will this year be under the 1916 record-breaking total, as evidenced by the fact that the output of twenty-three properties of North and South America for the first eleven months of this year dropped about 55,000,000 pounds below the total noted for the corresponding period of a year ago. These properties turned out to December 1 approximately 1,517,585,000 pounds of copper, against 1,572,500,000 pounds in the first eleven months of 1916. It is estimated that the actual loss in mine and smelter output in the United States due to strikes exceeded 100,000,000 pounds, but against this there was an increase of 40,000,000 pounds in the amount produced by the three American-owned properties in Chile and Peru.

In the first three months of the year prices steadily advanced from 38c to 40c, this figure proving to be the maximum, about the middle of March. About this time the United States Government purchased about forty-five million pounds of copper at 16½c. Being a long way below the current New York price, the market consequently weakened. Prices, however, did not decline very much until the same Government in July purchased another large quantity at 25c per pound; again much lower than the market. This was a further indication that lower prices for copper would eventually be established and the market naturally continued to decline. In October the American Government appointed a Copper Producers' Committee to which was entrusted the distribution of copper for the U.S. Government and the Allies, and the division of what was left among domestic consumers.

About the same time the price was fixed at 23½c per pound. The market under control assumed a routine character and has been steady here since. Prices in Canada eventually declined to approximately 32c per pound. There is some talk of a revision of prices and it is possible that 25c may be fixed, but no definite announcement has yet been made.

Tin

The average price of tin has been higher this year than in 1916, for the most part due to a shortage, varying in intensity. No tin can be shipped to this continent without a permit from the British Government. For reasons not altogether easy to explain in this brief space, permits have been difficult to obtain and supplies have been coming over in comparatively small quantities, particularly during the latter part of the year. The shortage of tonnage is to a lesser or greater extent responsible for this condition, in any case the result has been very low stocks of tin on this side.

Since the United States entered the war, the demand for tin plate has greatly increased for use in the manufacture of containers, cans, etc., for supplies for the army. For this reason the demand for pig tin has greatly increased, but supplies have not been received in sufficient quantities to take care of the increased demand. An acute situation has developed owing to the serious shortage and the United States Government contemplate making an effort to have a sufficient supply released to meet its needs, which continue to increase.

At the beginning of the year tin was quoted at 47c, but made a sharp advance in February to 58c. There was another sharp advance in price in May to 68c, followed soon after by a decline to 66c. The market for a while was steady, but easier, working back to 62c about the end of September. Early in November it became excited and prices advanced rapidly to 80c, at which level it still remains. If the authorities at Washington are able to influence the British Government to modify existing regulations thereby allowing a more liberal supply of tin to come forward there will likely be a drop in quotations.

Spelter

Spelter has been relatively the weakest of all the metals, due principally to the fact that the producing capacity of the refineries in the United States has increased to a greater extent than consumption called for. There has, of course, been a good demand, but the producing capacity was increased out of proportion to the consumption with the result that prices have been consistently weaker than those of last year, in fact the average price has been lower than the average for 1905. The zinc production of the United States has dropped over 30 per cent. from the highest levels attained when all plants, old and new, were running at full. This would indicate a curtailment of approximately 240,000 tons in the annual rate. During the first half of 1917, zinc was turned out at the rate of over 722,000 tons per annum, while in the ensuing quarter it was cut down to a basis of about 626,000 tons a year. The higher figure represented the top notch of spelter production resulting from increasing capacity for existing plants and the construction of many new smelters throughout the West. Production of zinc in Canada has increased this year, the largest refinery, located at Trail, B.C., turning out about 1,200 tons a month.

The highest price for spelter was early in March, when it touched 14c. It has since steadily declined until now it is quoted at 10½c per pound. The spelter market has also been affected by the proposal to fix prices, and has been weaker in consequence. After some delay the American Government early in December took the initial step in this direction by fixing the differentials. The latter for the U.S. Government prices between prime Western and the grades A and B were fixed at an advance of ¼c to ½c for brass, 2c for grade B and 3c to 3½c for grade A. The base price or the price of prime Western, however, has not been established, but will likely be so in the near future.

Lead

The lead market has been strong for the greater part of the year and the highest price since the beginning of the war was reached during the month of June. For the greater part of the year there has been a shortage of lead, varying in degree, which has resulted in the abnormally high prices affecting a number of lead products. At the beginning of the year lead was worth 9½c per pound. In February there was a sharp rise in price to 12½c followed by a steady advance which culminated in the record price of 14½c about the middle of June. In July the situation became easier and prices gradually slipped back, accompanied by some fluctuations, until September, when there was a sharp decline to 12c. The price ultimately dropped to 8½c, at which point it has been stationary for more than two months. The readjustment in prices was due more than anything else to the pending control of the market by the American Government, and by its purchases at a figure considerably below the market at the time.

The situation in regard to the supply of lead became easier during the latter part of the year until quite recently, when a scarcity developed. Prices, however, are not likely to change materially until the situation clears up following the action of the American Government. Even then it is doubtful if there will be any pronounced movement in either direction, for when the price is fixed the market will become steady.

Good progress has been made in the industry in Canada this year. The refinery at Trail is now producing lead at the rate of 1,700 tons per month and it is likely that the output will be increased in course of time. The Imperial Munitions Board have agreed to purchase the entire production of this refinery until March, 1918. The Board recently placed an order for 6,000 tons of lead with the Trail refinery. A few months ago the Dominion Government placed an embargo on the exportation of lead and zinc into the United States, but this order was eventually lifted following representations by the Provincial Government of British Columbia.

Antimony

The antimony situation this year has differed little from 1916, although the price has not advanced to the same extent. This metal owes its present importance entirely to the war and consequently the consumption has been fairly heavy. Practically all the antimony used on this continent now comes from China, English antimony being off the market. The production of Chinese antimony has been increased considerably during the past few years and the supply and demand is now fairly even. Shortages of varying duration have existed at different times, but the situation in this respect has never been very serious. The market has been devoid of any particularly exciting feature, although prices have been subject to some fluctuations.

At the beginning of the year antimony was worth 18c per pound, but made a sharp advance in February to 35c, reaching the high water mark, 36c, about the middle of April. Early in May weakness developed and prices declined until about the end of July, to 20c, remaining steady at this figure until September, when the price dropped to 19c, and in November to 18c, at which point it remained stationary. The price has thus worked back to the point where it started.

Aluminum

Conditions in the aluminum market this year have been practically a duplicate of those existing in 1916, doubtless due to the fact that the output of this metal is controlled, and as a result it has been sufficiently scarce to keep prices very high. The market has been more or less featureless during the entire year with no developments to create more than passing interest. Prices have been steady. For the first six months of this year, quotations were unchanged at 68c, which was, with the exception of two months, the same level as last year. In July prices dropped to 65c and in August to 64c, finally touching 62c in September and remaining stationary at the latter price for the balance of the year.

* * *

MAN POWER BIGGEST FACTOR IN INDUSTRY

WHAT is going to happen if the output of steel is not increased? The fate of the war depends largely upon the steel production of the United States, and the out-turn is being seriously retarded by lack of fuel, iron, transportation facilities and labor.

The seat of the trouble which is hampering production at this time is labor. There are not enough men to man the steel plants. There is also not sufficient fuel to operate them for the same reason, and the facilities of transportation have proven entirely inadequate to the extra strain. The consequence has been that production instead of increasing is declining, and the out-turn of some mills is reported to have been reduced to 50 per cent. of normal capacity.

As for iron, the outlook is still more serious. The lack of man power is holding up production of ore, of fuel, and consequently of iron and steel. In the Eastern market recently there were inquiries for upward of 25,000 tons of basic and foundry iron. The great bulk of this demand must disappear because there is nothing with which to satisfy it. It is estimated that of the tonnage asked for probably not more than 5,000 tons will be found available for distribution.

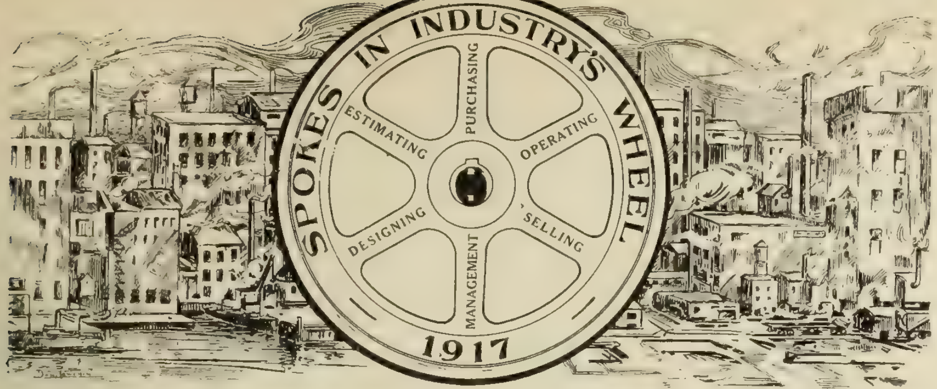
The inquiries are for large and small lots for delivery from now to next July.

The furnaces are also growing cautious about extending their engagements for next year, as they are already well sold up and behind on their present contracts for the year. Steel makers and foundry men are clamoring for iron all over the country, and the market has probably never before been subjected to such a combing process with so little tangible result. It is well for industry in general that the price is fixed or the market would undoubtedly be thrown into an unprecedented state of panic.

* * *

AMPLE STEEL SUPPLIES FOR WAR

AMPLE supplies of steel for all the Government's war needs were assured to the War Industries Board by representatives of the largest steel mills in the United States. They proposed, however, a different system of allocating orders to take into consideration idle capacity, the fuel supply and transportation conditions. In line with this suggestion, hereafter placing of orders will be centralized in the hands of J. L. Replogle, the board's steel expert, and it is believed that deliveries will be expedited. Ways and means of expediting production of the war instruments which are to bring victory in the war occupied the attention of the conference almost exclusively during the two hours the meeting was in progress. Whether the filling of war orders would leave sufficient steel for private industries was declared to be "another question," which none of those present would answer definitely.



The constitution of industrial enterprise is largely departmental—"Spokes in a Wheel." This series has for its object the featuring of, in racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting effectively, energy in a variety capacity as "Spokes in the Wheels" of steam, electrical and hydraulic and refrigeration engineering.

WILLIAM JAMES McSHANE

NOT the least prominent of those sections of the Dominion affected by the industrial activity of the past three years is the province of New Brunswick. While affected to a considerable degree by the demand for munitions, the urgency-inspired development of shipbuilding has, to a greater degree perhaps, been responsible for the present state of activity in this particular section of the busy East. When the influence of agricultural and allied interests in a generally prosperous district are considered, the ultimate demands on establishments doing a general engineering business are both large and varied. Considerable interest, therefore, attaches to the personality of the subject of these remarks, whose lifetime association with a leading New Brunswick engineering firm has resulted in his reaching a responsible and trusted position therewith.

Canadian born of Canadian parents, William James McShane first saw the light in St. John, in the year 1865, and to-day, after 35 years in the service of T. McAvity & Sons, discharges the duties of chief draftsman and patternmaking superintendent. While much of Mr. McShane's success is no doubt due to the guiding influence and tuition of his father who held the position before him, it is no disparagement to his parent to remark that the developments of recent years have brought greatly increased responsibilities and demanded a degree of judgment and resource largely exceeding the old days when our Spoke was absorbing the rudiments of his lifework.

The day schools of St. John were his source of knowledge until the start of his apprenticeship with McAvitys in 1883, at the age of eighteen. The regular 5-year period of training was gone through by Mr. McShane, and the fact that this formative period of his life was spent under the supervision of his father has doubtless been a matter of mutual benefit to our Spoke and his employers on many occasions since. Doubtless Mr. McShane reasoned that a part of the country which was good enough for a firm like McAvity (they had been established almost half a century when he joined them) was quite good enough for him, and the determination to do well whatever came to his hand accounts for his following the example of his employers and becoming also, so far as lay in his power, long established.

WILLIAM JAMES McSHANE.

The name of McAvity is a household word in the Maritimes, as will be gathered from the nature of their business. Established in 1837, they developed with the country, operating the Vulcan Iron Works and a separate plant devoted to brass work, producing plumbers', steam fitters' and engineers' supplies while recently a machine shop of considerable size has been rendered necessary to meet their requirements. The wide field of activity open to a studious, resourceful and energetic person in the position filled by our Spoke is apparent, and that Mr. McShane fully availed himself of the opportunities offered is evidenced by the numerous inventions, etc., in the various lines produced by McAvity. Numerous types of valves, fittings, electric railway semaphores and corporation specialties are the fruit of his efforts or bear the impress of his influence in some form or other.

The close attention to work necessary to insure such a record may account for the comparatively small amount of traveling done by Mr. McShane but the requirements of his position did not prevent him from following the advice contained in the old saying about "all work and no play, etc.," and his record in rowing matches and similar sports is evidence of his physical as well as mental ability.

Our Spoke is of the Liberal persuasion in politics, is Roman Catholic in creed, and beyond being a Knight of Columbus has few society affiliations. His belief in the value of temperance is well seconded by his efforts for the cause, and he acknowledges that much of his success has been due to his close ties with the Father Matthews Temperance Society. He has been bereaved through the death of his wife, and resides at 27 Duke St., St. John, N.B.

In speaking of his career, Mr. McShane attributes most of his success to having "acquired practical experience, at the same time developing the ability to back it up by the study of technical books and journals, the former to keep the rudiments of knowledge always fresh, and the latter to maintain close fresh, and the latter to maintain close touch with recent developments in products and equipment, and acquire a knowledge of the methods and devices employed by others."

* * *

FORETHOUGHT AS A SAFETY FACTOR

By S. H. R.

EXPERIENCE is one of man's best educators but it is very often a hard taskmaster. The bulk of the knowledge that most of us have acquired has been doled out by this ever existing and often unrelenting teacher; and it is probably well that is is so, as many of the lessons thus learned are more likely to make a lasting impression upon us than if the same were handed down to us as a sereditary legacy. How many men to-day profit by the experience of their elders? The majority of us are like the child that must touch the fire even after being told of the danger. More accidents arrise from thoughtlessness or carelessness on the part of the workman than from the faulty condition of the plant equipment The human element is the most perverse factor in the safety problem of shop management. We are prone to criticize the actions of those about us, but too often fail in a proper analysis of our own accomplishments. A frequent cause of injury to machinery is the impulsiveness of the operator, this trait being particularly pronounced in young apprentices and inexperienced mechanics. The first duty of a workman, when placed upon a new machine, is to become familiar with his operating mechanism.

Many machine tools of to-day are equipped with every facility for maximum efficiency, and at the same time relieve the workman of much of the physical and mental effort incidental to the manipulation of equipment of the last decade. This does not mean that it requires a less skilful operator to do effective work on a modern machine, as it is probable that closer attention is now required than ever before, owing to the greater possibility of becoming confused by the various knobs and levers. The semi-automatic nature of present day metal working tools has, however, destroyed much of that reasonable power that in former days was as comman in the average workman. Apprentices and older mechanics should endeavor to cultivate the habit of speedy but accurate forethought in the discharge of their duties, as a mental review of possible developments will often prevent injury to a machine or an operator.

To illustrate by an example: Some time ago a young mechanic was boring piston ring castings, which in the rough weighed about 80 lbs. After completing the work on one of these he placed another one in the chuck without removing the boring tool from the tool-post. In order to center the work—a four jaw chuck being used—one of the jaws was slackened, leaving the casting supported by two others; turning the work through an angle of 180 deg., and with the right hand placed on the upper portion of the ring to steady it, he started to adjust the casting to position. One of the side jaws, however, had apparently been resting on a small lump, so that the downward pressure from the top screw released the work, causing the piece to fall from the chuck, and catching the man unprepared his hand was caught between the tool nd the work, resulting in a badly lacerated finger. A little forethought in removing the tool, or supporting the work while setting, would likely have prevented the injury sustained. Accidents occur every day through over impulsive action on the part of workmen, which a moment's forethought would oftentimes prevent.

* * *

MAGNESITE BRICKS NOW PRODUCED IN BRITAIN

By T. J.

IN THE search for highly refractory materials to resist the intense heat of the steel furnace the valuable properties of magnesia claimed early attention, and fire-brick made of calcined magnesite took very high rank. The supply of magnesite, an impure carbonate of magnesia. the new substance employed, was largely in the hands of foreigners, and at the outbreak of war British steel manufacturers found that stocks of these bricks were becoming exhausted and prices rising to an alarming extent. In these cicumstances the Government commandeered the magnesite, and steps were taken to regulate the trade.

The best brick from the continent were made of substances found in Styria and entirely in Austrian hands, but very excellent magnesite is obtained from Greece, and first-rate bricks are now being made in England from the magnesite procured from Greece and the Levant. In some respects the English bricks are superior to those hitherto obtained abroad, but difficulties have arisen, owing to a tendency to "spall" or become chipped at the surface. This may be due to unequal contraction of the components of the brick, or to some defect in calcination. The Austrian bricks contained a larger percentage of iron in combination with the magnesia than those made from the Grecian magnesite, which is relatively much more pure, and it was hoped that by adding a sufficient amount of an iron compound to the raw material good results would be obtained. This has not hitherto been found to answer, but experiments are being made which already give promise of good results. Some kinds of bricks made from fireclay and pure silica show much the same defect in use as those prepared from the Grecian magnesite.

* * *

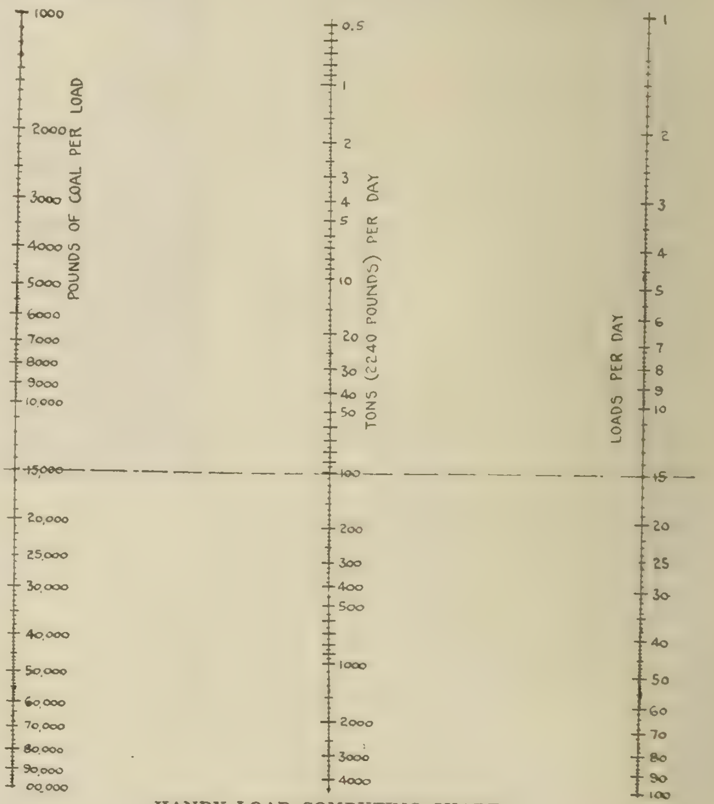
HANDY LOAD COMPUTING CHART

By N. G. Near.

THE accompanying chart will be found useful in making load computations. You don't have to use a pencil at all, nor do you have to work it out mentally. Just stretch a thread or string across from known point to known point and the problem is solved.

For example, if you have a truck that will carry 15,000 pounds, and the truck can haul 15 loads per day, how many tons (of 2,240 pounds) will it haul per day? The dotted line drawn across the chart shows in the middle column that the truck will carry 100 tons per day.

The chart can be used in various ways. If, again, you want to carry 100 tons per day, and your truck will hold 15,000 pounds, the same straight line will show you that you will have to make at least 15 trips per day to haul that much.



HANDY LOAD COMPUTING CHART.

It will be noted that the range of the chart is very wide. It can be used in connection with carload lots as well as with wagon or truck load lots.

* * *

ELECTRIC STEEL MANUFACTURE IN DENMARK

A COMPANY has been formed in Denmark, with a capital of 600,000 kronen, for the manufacture of steel from scrap, which is being smelted and refined and a little new iron added. It is said to be the same process which the Krupp works use for the manufacture of their best guns. To commence with, the new undertaking will confine its work to the production of smaller articles, machine parts, etc., but it is proposed to extend it. ere long, also to comprise heavy ingots by the Siemens-Martin furnaces, of which so far only one has been in use in Denmark—in the Burmeister and Wain establishment. Scrap is said to be available in sufficient quantities, but up to now it has principally been exported to Sweden. The new company, consequently, is fairly independent of foreign supplies, which is a very important point under the present circumstances. The undertaking is backed by several prominent men, and the installations will ultimately be on a large scale. The foundry building is two-storied, and has a length of over 100 m. Operations will commence probably by the end of November, and work is expected to be in full swing in the beginning of the new year.

Montreal.—The Dominion Bridge Co., contemplate installing a forging plant at Lachine for the production of marine forgings.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

PATTERN-MAKING NOTES—TURNING

By J. W. Broadbent

WHY average pattern shop should be dumping ground for all worn out lathes in factory, is a difficult question to answer. Some manufacturers regard pattern-making as a total loss, and loss indeed becomes real, when in the course of a few months enough time is wasted adjusting the tool rest and tailstock as would purchase a "good" lathe.

One pattern shop will have a lathe with a wooden bed, the tool rest support being secured to the bed with a hardwood wedge, and every time the lathe is started, it will have a tendency to take a flight across the room, owing to being too light for a speed lathe, and not securely fastened to the floor. Another again will have a bolt and nut for the clamping arrangement of the tool rest and tailstock which necessitates using a wrench—and the wrench is always missing from the lathe when wanted.

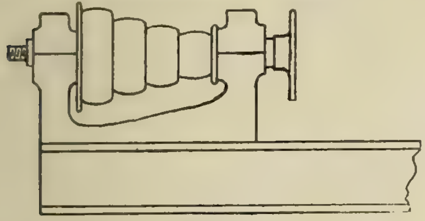


FIG. 16.

The lathe is the most indispensable machine in the pattern shop and it certainly pays to have one designed for the purpose, for there is no reason why pattern shop machinery should not be provided with labor saving devices which are so essential in the machine shop. The slide rest is useful for turning big work such as columns and pipes, but as it is not to be found in many shops we will confine this article to a description of the more common speed lathe and its accessories.

The Speed Lathe

The headstock spindle should extend through the bearing and be threaded so as to receive faceplates and chucks for turning work of large diameter, and the best arrangement is to have the small end of the cone towards the front of the spindle, Fig. 16, so that the back of a job on the faceplate can be turned to better advantage; the large end of the cone is then not in the way of the tools or operator's hands.

Owing to the necessary high speed of a wood turning lathe, there should be provided efficient means of lubricating the bearings, for when the bearings become worn and the lathe makes a noise like a steam hammer it is impossible to turn work accurately.

The headstock and tailstock spindles should be in perfect alignment and both have a taper hole to receive the centres and chucks.

All adjustments to the tool rest and saddle should be so devised that a wrench is not necessary, for during the process of turning a pattern the tool rest may have to be moved twenty times or more and the inconvenience of finding a wrench or adjusting a monkey wrench to fit each nut, not only is a waste of time but tries the temper of the operator.

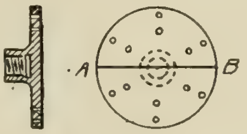


FIG. 17.

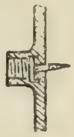


FIG. 18

Greater accuracy is required in pattern turning, than in ornamental wood turning, and although the tools and chucks required may not be so numerous, the building up process of the wood to be turned must be done in such a way that the finished pattern will keep its shape.

Precision Required

If the professional wood turner were turning—say—a bread board 12 in. in diameter, the purchaser would not measure the article with calipers to see that the size was correct because it would not make any appreciable difference if the board warped or shrunk. But when the pattern-maker is called upon to turn a pattern for a 10 in. threaded pipe flange from which fifty or more castings are wanted, and no preliminary turning has to be done to the casting before the tap is run through, it is easily understood that each casting will have to be the same size, and the pattern built up in such a way that it will keep its shape. It will also have to be turned as accurately as the nature of wood and the measuring tool employed will allow.

Accessories

Tool rests should be provided in different shapes, so that awkward corners may be turned with ease. There is no saving in having a tool rest made of cast iron for it is too easily broken; a wrought iron one will last longer, and it won't be necessary for the operator to count his fingers so frequently.

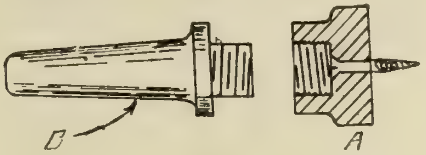


FIG. 19.

Fig. 17 shows the general style of faceplate used for pattern turning, the wood to be turned being fastened with wood screws. These should be provided in various sizes and if a line A B is scratched accurately across the centre of the face, it will be found a great convenience when turning patterns and core boxes in halves.

In the small size faceplate if a hole is drilled through the centre as in Fig. 18, so that a wood screw can be driven from the back into the piece to be turned, no other fastening is necessary, provided the pattern is small.

When using a centre screw face plate a hole should always be bored in the work a little smaller than the wood screw used; the neglect of this either splits the wood or breaks the screw.

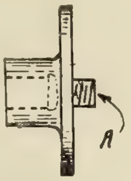


FIG. 20.

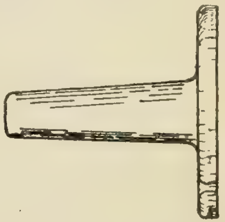


FIG. 22.

A design for a screw centre chuck to fit the taper bore of the mandrel is shown in Fig. 19. The work to be turned is screwed onto the piece A, which in turn is screwed to the tapered centre B. The piece being turned may be removed as many times as necessary without getting the work "out of true."

When turning gear blanks or other work where holes have to be bored to receive the shanks of core prints, the chuck shown in Fig. 20 is indispensable. The projecting screw A is ¾ in. diameter and is cut 8 threads to the inch, the thread having a sharp cutting edge which will cut easily into the wood.

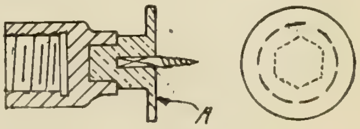


FIG. 21.

For small work fastening to the face plate with wood screws is not necessary, but for larger work where the centre screw is not enough support for the job, a combination of the tapered centre B Fig. 19 and a face plate as shown in section in the diagram Fig. 23 can be used, A representing the work to be turned.

When using this chuck the work will have to be centred first and the wood screws fastening it to the face plate driven in and taken out while the face plate is on the mandrel. Fig. 21 shows a screw centre chuck which has given good service; the part A is of brass and the centre screw has a square head which is soldered into a hole bored into the brass face. Behind the face is a hexagonal shoulder to facilitate removing the work while fastened to the centre screw.

A face plate with a tapered shank to fit the bore of the mandrel Fig. 22 is useful for turning small patterns, the work being secured to the face with wood screw.

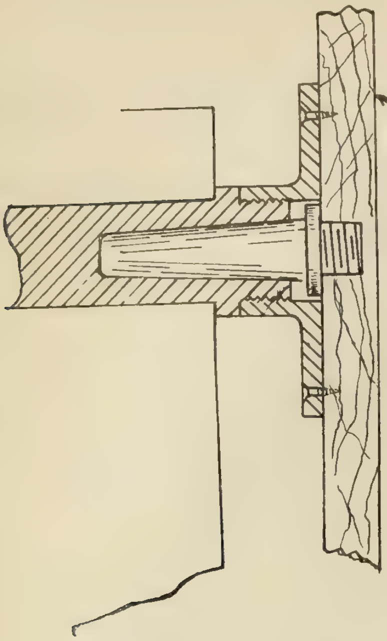


FIG. 23.

* * *

A TALE OF A RUN-DOWN SHOP

By H. Middleton.

WHEN Bob Philips undertook the job of rehabilitating the Drew Hat Co. he thought he would have a great deal of hydraulic work to do; in fact, it was because of his experience as a machinist on such work and his ability as an organizer that the second generation of Drews hired him. The elder Drew had founded the business shortly after he came to America, and having always made money in it, had been satisfied to let things go on as they were; but after his death the sons decided on a more up-to-date policy.

The hat business is a big user of presses and steam—hydraulic, steam lever, and toggle presses. Philips found the hydraulic presses in good shape, also the accumulators, pumps, and piping; they were of English make, and had been in charge of a Yorkshire man, who took pride in them because of that. But the lever and toggle presses being so "simple," had had little or no care simply because they had been left to the unskilled hands who worked on them.

A saving of over $500 on the first trip through the press room is rather unusual, but it was made in this instannce. The hand-operated presses are all counterweighted, and Philips noticed an unusual form of counterweight, consisting of a box filled with junk. His investigation led to an examination of the junk, which proved to be spelter and lead—and from 150 to 300 lbs. of it on every machine. The substitution of a baser metal scrap for the spelter made a good start. Further savings were made on the overhead by such simple means as washing the windows and so cutting down the light bill; having the floor swept in the corners and under the presses, netting an unbelievable heap of well chewed tobacco quids, which sold for $15 for fertilizer; and in having the rusted joints of some of the presses that "wouldn't work" loosened up and oiled, thus increasing the capacity of the press room twenty per cent.—which goes to show that there are homely ways of making money without spending it.

* * *

TONS OF COAL IN ELONGATED PILES

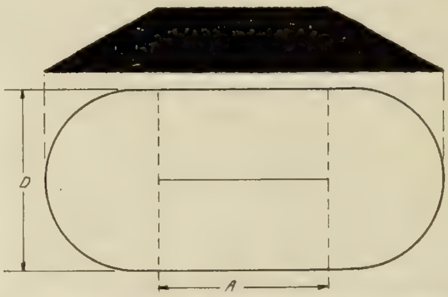
By N. G. Near.

WHEN bituminous coal is piled in a conical pile the tonnage in the volume is easily estimated from the formula, $0.00248\ D^3$, where D is the diameter of the pile in feet at its base. But coal is often stored in elongated piles, as shown in the accompanying sketch, in which case the tonnage of bituminous coal is computed from the formula:

$$0.00248\ D^3 + 0.00474\ AD^2 = \text{tons (bituminous)}$$

where A is the length of the "crest" on the pile in feet. The best way to determine the length of this crest is to subtract D from the total length of the pile at its base.

The sketch shows one of these piles both in elevation and in plan. The plan shows clearly how the pile can be cut up into three parts. The two curved end portions, when added together, give us a pure and simple cone, whence we have the $0.00248\ D^3$ in the formula. The central portion has a triangular section from end to end, and its volume is one-half as great as would be the volume of a rectangular block having the same base and height. The tonnage in this central triangular portion is $0.00474\ AD^2$. Adding the two together we, therefore, have $0.00248\ D^3 + 0.00474\ AD^2$.



SKETCH SHOWING METHOD OF CALCULATING COAL PILE CONTENTS.

Where the coal is anthracite instead of bituminous the formula becomes

$$0.00172\ D^3 + 0.0033\ AD^2 = \text{tons anthracite.}$$

D and A are both measured in feet.

These formulas are based on the fact that one ton of coal occupies 38 cu. ft. on the average, whether anthracite or bituminous.

RECENT DEVELOPMENTS IN POTASH PRODUCTION

THE influence which it is possible for the cement and iron industries to exert on the production of potash is of considerable importance at this time, and the possibility of this influence increasing in the future is the belief of Richard K. Meade, expressed in an article in the "Manufacturers' Record." The necessity for development work on this continent has been growing more urgent with the continuance of the war, some idea of the urgency being conveyed by the statement that the imports of pure potash from Germany before the war amounted to 250,000 tons, while 10,000 tons only were produced in the United States last year, as estimated by the Geological Survey.

Recent reports in Canada indicated the probability of production being increased by suitable treatment of feldspar in connection with cement manufacture. It seems, however, that the loss of potash by volatilization from rotary cement kilns was pointed out as far back as 1903, and that from blast furnaces still earlier, but before 1914 nothing was done to collect the substance from either source.

Some ten years ago a dispute arose between the orange growers in South California and the cement mills over the question of the damage caused by the dust from the mills being deposited on the fruit trees, and to settle the matter the Riverside Portland Cement Company installed a process for precipitating the dust by the Cottrell electrical system. This process not only proved efficient as a dust-catching device, but also collected the potash with the dust. Most of the potash being water-soluble, it can be dissolved out of the dust by leaching with water. Before the war the raw materials used at Riverside were low in potash, and hence the amount volatilized was small, but after the outbreak of war the company found they could increase the output of potash from their kilns by the aid of feldspar, which can be used without injury to the cement. They also found that mixing fluorspar with the raw materials increased the amount of potash volatilized to 90 per cent. of the amount contained in the raw materials, as against 50 per cent. volatilized under usual conditions. They next extracted the potash from the dust, and by crystallization obtained a potash salt containing at least 35 per cent. of potash. The crust which collects in the stacks of the rotary cement kilns contains from 6 to 12 per cent. of potash, and of this large quantities have been sold to the fertilizer companies since 1914.

In the summer of last year the Security Cement and Lime Company put the Cottrell process into operation in order to catch all their kiln dust. They found that the addition of salt to their raw materials increased the yield of potash, and at present they are obtaining about 20 tons of dust a day, averaging 10 per cent. of water-soluble potash. The Santa Cruz Portland Cement Company are recovering 700 lb. of potash daily from their kilns by a process of their own, and a number of other cement companies are installing or have installed Cottrell plant. When all these plants are in operation Mr. Meade estimates that they will yield about 10,000 tons of potash annually, and this amount, he states, could be very greatly increased by using feldspar as a raw material.

As to potash from blast furnaces, the only iron company in America, so far as he is aware, selling potash at present is the Bethlehem Steel Company. Up to the present only the dust which can be collected by means already at hand has been sold, the amount being estimated at about 4 per cent. of the total potash liberated; but the chemist of the company believes that apparatus could easily be installed to catch at least 50 per cent. of the potash now lost, and that the apparatus, so far from interfering with the operation of the plant, would benefit it through the better cleaning of the gas for the engines. It is estimated that of the potash volatilized in the blast furnaces the amount recoverable will average at least 10 lb. per ton of pig iron, so that with an annual production of 25,000,000 tons of pig iron the blast furnaces of the United States would produce, say, 125,000 tons of potash.

DOCTORS ARE REALLY ENGINEERS

COL. W. O. OWENS, in charge of the Motion Picture Department of the American Medical Museum in Washington, under the direction of General Goorgas, declared at the recent convention of the American Society of Mechanical Engineers that he had come to look upon doctors and medical men as biological engineers, inasmuch as their chief business was to keep the human engine in perfect working order. His statement was emphasized by Major Frank D. Gilbreth of the Engineers Officers' Reserve Corps, who described how the soldiers crippled in the war are provided with means for performing useful industrial work and making themselves self-supporting. In the course of the discussion on the crippled workers, illustrations were shown of men putting on their trousers with blacksmiths' tongs, one-armed men driving nails with magnetic hammers quicker than two-armed men could with ordinary hammers. Major Gilbreth urged the universal employment of cripples in work which they could perform and said it would be socially indecent for employers to give a job to a normal person when a cripple could just as well do it. He told how efficient cripples were in industrial plants.

IRON ORE THE BASIC CAUSE OF GREAT WAR

INDISPUTABLE facts which have not suffered even a suggestion of contradiction have been repeatedly stated by various writers regarding the ulterior motive of Germany in precipitating the present conflict. The industrial development of that nation is punctuated by a series of incidents whose continuity and gradually increasing deliberateness leave no room for doubt in the mind of an impartial observer that the war was "planned" in every sense of the word.

Speaking before the National Association of Manufacturers in the States recently, Rev. Newell Dwight Hillis gave a brief resume of known historical facts which throw an interesting light on past events and indicate the future effects on various nations according to the outcome. He said:

"If I understand this war right, it is, essentially, a war for hematite iron ore. It is the greatest war in history, because it is a war for the greatest thing in industrial history, namely steel; without hematite iron and good coking coal you cannot make steel.

"In 1866 Germany was an agricultural people. She had no manufacturing life. All that has its counterpart in your wonderful manufacturing systems in this country did not exist in Germany at that time. First, she captured that coking coal province from Austria. Then she captured Alsace and Lorraine. That was in 1870. But the important thing was this: Germany held a conference of twenty leading men of Germany in Berlin, presided over by Bismarck. In 1866 England led Germany in five things; first in pig iron, second in steel, third in woolen goods, fourth in cotton goods, fifth in the building of ships. In these things Germany was hopelessly behind. Then it was that Bismarck developed his scheme for a world empire that later hypnotized the Kaiser. In 1909 the Kaiser called his ministers together to consider a report presented by the mining engineers of Germany. That report was on the danger which threatened Germany by reason of the exhaustion of her iron supplies. The majority report of the mining engineers said that by 1925, one-half of the factories of Germany would have to shut down for the lack of iron. The minority report gave her thirty years. From this we can understand how desperate Germany was. Then came the discovery of the great iron mines down in Morocco. Fourteen days after the discovery of those mines, Germany had her biggest dreadnought in the harbor of Agadir. Diplomats know it as the Agadir incident. We know how Belgium, Spain, and Portugal united their forces; and how Germany then determined to mobilize her troops the following Monday. Then it was that the business men brought pressure to bear. The Bank of England, the Bank of France, the Rothschild banks, called their loans on the German people, a billion three hundred million dollars. Once more Germany was at bay. She ceased to plan for the mobilization of her troops.

"Some years ago, one of our authors called attention to the discovery of the new iron veins running across Northern France, and containing a great blanket body of hematite ore. It was the most marvelous event in the manufacturing life of Europe during the last one hundred years. The engineers of the French government made borings, and on tracing that ore deposit westward they found it disappearing on the frontier lines of Belgium. When Germany's troops started west in August, 1914, it was to grab that iron ore. Germany went into Belgium to get command of the iron mines of Belgium. A few miles away lay the newly discovered iron mines in northern France. The Prussians fought unto death for the iron mines controlled by that little pass at Verdun. It is said that Germany lost six hundred thousand men in that battle. Why did she make that desperate struggle? For this reason: The little pass of Verdun opens into the great basin of the Brie. From the hour Germany got in there in August, 1914, she began to load every day two or three freight trains with fine hematite ore, and the struggle at Verdun was to control that treasure. For that hematite iron ore Germany is going to fight unto death. The war in South Africa was a gold and diamond war. The war in Mexico to-day is a land war. The war between Russia and Japan was a forest war. This war to-day between Germany and France and Belgium is a war to control the iron mines of Belgium and France, and the coking coal, looking forward to the control of Europe for the next two or three centuries. William Morton Fullerton, in his wonderful book, "Problems of Power," calls attention to the fact that there is enough high grade iron ore now bored in northern France to take care of all the people of Europe for the next three to five hundred years. Germany is going to fight unto death for that iron ore. It is a struggle for steel. Ours is a civilization based upon steel. Steel means locomotives and looms, presses, Pullman palace cars; means enormous wealth for the country through tools and conveniences. As these iron mines go in this war, therefore, so civilization in Europe will go."

* * *

EXPERIMENTS to determine the effect of the atmosphere on different kinds of iron sheets have been made recently in the United States and show that the effects differ according to the atmosphere and kind of metal. Prepared pieces were exposed to atmospheric corrosion, and from the first the character of the rust formed on the different materials was found to differ considerably. Whereas on the Bessemer and open-hearth steel samples the rust was of a yellowish-red color and became loose rapidly, the rust on the others was dark in color and much more adherent; this adherent condition reached its maximum in the copper steels, where the rust was very dark and fine-grained. As a result of the tests it is concluded that copper-bearing steels are decidedly superior to pure iron, steel or charcoal iron. The addition of copper to pure iron increases its resistance to corrosion, but not to the same extent as similar additions to steel increase the resistance to corrosion of this material. Charcoal iron and pure iron are superior to steel as regards resistance to atmospheric corrosion.

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WHAT BRINGETH THE YEAR?

ON very few occasions in the memory of those living has the beginning of a new year been so fraught with possibilities, beneficial or dire, probable or improbable, as the beginning of 1918. Week after week, month after month, year after year the war has been influencing our lives to an extent not yet comprehended by all of us though more or less fully comprehended by some.

Even as the year is born we are witnesses of the most impressive contrast ever afforded in the history of nations in our ken. The most threatening combination of militaristic powers ever centred in the grasp of a few ambitious madmen is making desperate efforts to call it quits and assume the role of peace-loving brethren of mankind, while the most peaceable of the world's leading nations is just as desperately straining every nerve and fibre to prevent the perpetration of the most gigantic fraud on civilization ever attempted.

"Achievement of the purposes for which the Allies are fighting is essential to the future freedom and peace of mankind."

This score of words forms part of a letter sent by Premier Lloyd George to the special National Labor Conference held at Westminster, Dec. 28, which had been convened to consider a memorandum on war aims. The conference was attended by 750 delegates and went on record by a virtually unanimous vote that Labor, in continuing the war, is actuated by a determination to make the world safe for democracy hereafter.

In reaching such a decision, Labor has demonstrated that it has risen to the occasion like other essential components of civilization. During the few years immediately preceding the war the claim was made that war would never be possible on a decisive scale as the workingmen of the various countries would never rise in arms against each other, or in any way allow their services to be utilized in carrying on hostilities. Had such a scheme been feasible and strictly adhered to, and the calculated results obtained, the war would not only have been short-lived or never started, but the progress of the world toward democracy would have been immeasurably advanced.

The manner in which developments actually took place is now history. When the time for a decision came, the Huns unmasked themselves, their previous regard for the brotherhood of man was seen to have been but a feint to lull vital sections of the Allies' forces into a reluctant attitude which might have had very serious, albeit not deliberate, influences on the course of hostilities, and allied Labor was left with the alternative of admitting the failure of its previous ideals or being guilty of culpable slacking.

Freedom unbounded, uncontrolled, aimless and selfish—such a state induces national disintegration at an appalling rate. Freedom—unbounded but controlled, realization of its worth stimulating every effort for its defence, unselfish sacrifice a feature of its devotees—such an ideal is the inspiration of the great marshalling of finance, commerce and industry which we, as neighbors of the United States, are privileged to witness at close range. It is not what the name itself is, as what it stands for that counts to-day. Freedom, like the rose, by any other name would be just as sweet.

"The ideals for which we are fighting to-day are precisely those for which the British Empire entered the war."

In assuming the burdens of the coming year, burdens which will grow heavier and yield less recompense, we must keep graven on our mind this further statement by Britain's premier. The longer we have fought for them the more will we value our ideals when they are finally won. And, in this, the critical and possibly final year of the struggle, let it be ours to so act that of none of us can it be said "he eased off his hold."

With the official declaration of British Labor referred to, the reputation of Labor as a stable element of the Empire remains unsullied; with the advent of government control of railroads in the States the singleness of purpose of the Republic is made still more manifest; for Canada, a continuance of past efforts will more than maintain the good name of the Dominion as a tower of strength in time of stress.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

WAR TIME EFFICIENCY IN ELECTRO-PLATING—II

By Abe Winters

ELECTRO-CLEANING solutions and pipe coils used for heating cyanide copper and brass solutions should be carefully insulated from the feed and exhaust pipes; all permanent connections should be soldered; acid dips should be replenished at regular intervals and maintained effective until of reasonable age. The preparation of fresh acid dips daily is rarely necessary, and then only when special coloring treatment is required upon high grade wares. Bright acid and sulphuric dips improve with age to a certain limit, and the practice of needless waste such as has characterized the mismanagement of munition plating plants is absolutely ridiculous.

The plan of the polishing, plating and buffing rooms is of greater importance than generally admitted; the plating room is possibly the one more usually of poor design. A business which includes electro-plating may often succeed in spite of excessive waste and expense in the finishing departments, but with a reduction of this waste and loss through inefficiency, the general overhead reduction would permit of improved conditions affecting a large percentage of the factory employees, and eventually result in better business and more harmonious relations between employee and employer.

Hygienic Conditions Essential

Ventilation of the department is of vital importance. The unsanitary conditions of many plating and polishing rooms are deplorable, particularly so when the personnel of the firm include men who have received scientific training in modern shop practice. Mental or physical efficiency in the employee cannot be expected if he is obliged to labor in a dense atmosphere of poisonous fumes day after day.

Foremen and helpers should bear in mind that commercial electro-plating is a process entailing considerable waste of supplies and power, which it is practically impossible to avoid, and for this reason the entire staff should harmoniously co-operate in any scheme which may improve the efficiency of any idea or method now employed. Efficiency in modern plating practice is not necessarily the result of new equipment or rapid cleaning and depositing processes—it is more frequently due to the direct application of practical common sense properly based on the fundamental principles of electrolytic deposition of metals. We do not know of a plating plant in operation in this country which is producing 75 per cent. of its possible output.

Any carefully conducted polishing and plating plant will produce a satisfactory profit if due attention be given to minor details of the business, and if the capacity of the plant be fully employed. Idle or partially filled baths are not productive of profit, small anode surface is not economical; in practical electro-plating the weight of the anode has no direct bearing upon the actual efficiency of the anode in the bath.

Current Density and Anodes

In all plating operations we arrive at our current density values by knowing our cathode areas; we do not consider anode weight. The cathode area must be in proper proportion to the anode area in order to operate the bath efficiently and economically. Thus it is obvious that the effective anode surface area, instead of the anode weight, concerns us where results are of first importance.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers 1917-1918

President—T. Charles Orr, 281 Westmoreland Avenue, Toronto.
Vice-President—James Vallier, 701 Crawford Street, Toronto.
Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ont.
Sergeant-at-Arms — John Lougheed, 339 Lippincott Street, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

An anode 10 in. x ½ in. x 14 in. would weigh approximately double that of an anode 5 in. x ½ in. x 14 in., but the latter would present 86.5 sq. in. of effective anode surface, while the former would present only 159 sq. in. of effective anode surface, and owing to greater width would not deposit uniformly over cathodes of narrow or irregular shape.

Nickel anodes containing from 5 per cent. to 15 per cent. of iron and tin are universally employed with the double sulphate nickel solutions; progressive firms are discarding these solutions or converting them into modern rapid baths. With these the pure metal either in the form of castings or in the form of shot can be utilized. The shot requires special equipment for the bath.

Regarding Nickel Anodes

Pure nickel anodes will not corrode readily in the old style solution; therefore, iron was introduced and some makers add small percentages of tin. The iron and tin were supposed to whiten the nickel deposit, as well as aid in the disintegration of the anode in the bath.

Pure nickel anodes produce whiter deposits than the alloy—the iron soon fouls the solution, and with a fouled solution it was, and is now, impossible to produce perfect deposits rapidly. Deposits containing even small percentages of iron are not as resistant to corrosion from atmospheric influences as pure nickel deposits. The solution cannot be self-sustaining. The bulk of the iron is precipitated to the bottom of the tanks and is thrown away. The manufacturer pays for nickel—why buy iron at the price of nickel to contaminate the plating bath and nickel deposits, then eventually throw the material down the sewer, as it is useless as slime? The plater is expected to deposit nickel to form a protective coating over iron and steel—why give him iron in the anode when better results may be obtained from the pure metal? We do not alloy our gold anodes to produce good gold deposits, and the same is true of silver, copper, zinc and tin anodes. It is equally as unnecessary in the case of nickel or cobalt.

Pure nickel anodes wear away uniformly to a mere nothing, the average waste being less than 3 per cent. of the original weight, and this waste is in a saleable form. Impure nickel anodes very frequently present a waste amounting to 15 per cent. of the original weight, this waste usually being of an unsaleable character.

Purity Essential

Some of the remarkable characteristics of pure nickel electro-deposits are: the extreme hardness of the plate, its adherent qualities, its firmness, ductility and the extreme denseness of thin coatings. These very valuable qualities may be attributed to a very large extent to the homogeneous nature of the deposited film. If we introduce iron into the nickel anode we curtail the efficiency of the resulting deposit as a protective coating over iron or steel surfaces. Furthermore, we lessen the efficiency of the nickel bath.

The opportunities for reducing operating expenses and, at the same time, increasing the output of the plating, polishing and buffing departments of the average plant are indeed many, and the task would not be difficult if undertaken with care and consistent application of brains.

Foremen who have become mere machines by reason of loss of interest in their duties, due to discouraging treatment by some officious person possessing a pull with the management, should be given especial attention at this period in order to enlist their hearty co-operation in the really important work which confronts the electro-plating industry of to-day.

Electro-plating as practical to-day is a commercialized science and cannot be properly regarded as a trade. The successful operation of a plating plant depends largely upon the manner in which the scientific principles of electro-plating are adhered to. Do not cheapen your product by slipshod plating methods; place a capable man in charge and demand results; then keep an observing eye on the department, but do not interfere when affairs are proceeding satisfactorily; it is the latter habit which converts capable foremen into mere plodders.

* * *

Questions and Answers

Question.—We have several hundred gallons of acid copper solution which we have decided to dispose of in order to make room for cyanide copper solution. The acid copper solution consists simply of copper sulphate and sulphuric acid. Can this solution be reduced or the metal contents reclaimed in any practical manner so that we could use the copper in our cyanide solution?

Answer.—For your purpose we would suggest reclaiming the copper from the acid bath as carbonate of copper. The following method would probably prove cheaper than most other methods, and its effectiveness may be easily tested by treating a small quantity of the solution before attempting to use the idea for the entire quantity of solution. To the acid copper solution add calcium hydroxide until the solution is neutral. The solution should be vigorously stirred while the calcium hydroxide is being introduced. When the neutral point is reached continue stirring for several minutes and then allow the solution to clear. The free acid having united with the calcium hydroxide and formed calcium sulphate, this compound will now settle to the bottom of the tank. The clear solution which remains is simple copper sulphate solution. Decant or syphon this clear blue solution off and heat it to near boiling point. Dissolve sodium carbonate in boiling water and add small quantities of this strong soda solution to the copper solution, stirring vigorously during and following each addition. The sodium carbonate reacts with the copper sulphate to form copper carbonate, which will be precipitated as a light green plastic mass, and being quite soluble in cyanide of sodium, it may be used in the preparation of the cyanide copper solution.

The precipitation may be effected from the cold solutions, but we advise heating if possible, as the precipitate forms densely and settles more rapidly, and is also more easily washed than when precipitated from cold solution. The vessel or tank in which the copper sulphate solution is treated should be as deep as is possible to obtain, and should not be filled to more than one-half its capacity with copper solution; each addition of sodium carbonate solution will cause the contents to greatly increase in volume by sudden liberation of gas, and if the space in the vessel above the copper sulphate solution is too small the liquid will flow over the top and become wasted.

After the chemical action ceases and complete precipitation is indicated do not add more soda solution, but fill the vessel containing the copper with hot water and allow to settle. Decant or syphon off the clear liquid, which is sulphate of soda and of no practical value. Then refill the vessel containing the carbonate with hot water and stir vigorously; then allow to settle again. Repeat the washing treatment until the wash water is free from soda; this point can be detected by placing a drop of the water on the tongue. Give the carbonate one or two final washes in clean cold water and place the plastic carbonate upon a cloth filter arranged over a wooden frame. Allow to drain for ten or twelve hours and it is ready for use.

If crystals of copper sulphate are found at the bottom of the plating tank they should be dissolved in hot water and the solution treated as described. The soda solution should be made as concentrated as possible in order to reduce the required volume of soda solution to a minimum and effect a saving in time and labor.

* * *

Question.—I have recently taken charge of a small plating plant which is equipped with a rheostat of the round type and a voltmeter which is connected to three tanks and the dynamo. I have never used a voltmeter during my brief practice, and would appreciate your help in getting acquainted with the instrument. One tank in the room has the rheostat in the positive line, and the voltmeter will not register voltage at this tank when a batch of work is being plated. When load is off, the voltage indicated is about the same as at the dynamo. Can you tell me what is wrong?

Answer.—The location of the rheostat in the positive line of the one tank has absolutely no bearing on the difficulty you have with the voltmeter. In order to cut down the strength of the electric current it does not matter at which point in the circuit the rheostat is inserted, as one volt divided by one ohm equals one ampere. Platers as a rule place the resistance in the negative line, but you will find equally as effective reduction of current with the resistance in the positive line. The maintenance of perfect joints is of much more vital importance than the location of the rheostat.

From your description of voltmeter indications we can but infer that the instrument is connected to only one line from the tank equipped with the rheostat in positive line. This condition would easily be the result of force of habit and lack of thought on the part of the person installing the instrument or connecting same to this particular tank. Inspect the wiring, connect the voltmeter leads to the opposite electrode terminals, and we believe you will obtain correct reading on voltmeter.

In adopting the voltmeter as a guide for future plating operations do not confuse the advantages of this instrument with the advantages of the ammeter. The voltmeter is a valuable instrument for the plater, but of the two the ammeter is more useful if its uses are thoroughly understood. The voltmeter instantly indicates the reduction of current from any cause. The quantity of current passing is not indicated to the operator except in an unsatisfactory manner. The quantity of current passing through the tank bears a definite relation to the pressure or voltage, but is not indicated by the voltmeter. The ammeter indicates the number of amperes flowing and provides the operator accurate means of calculating his loads and time of plating; it helps him locate leaks, grounds, etc., and convincingly indicates the use of too small conductors at any point in the circuit. Study your voltmeter; use it as a friend, and then instal an ammeter. You will readily appreciate the improvement.

* * *

Question.—In the manufacture of carriage trimmings, cutter dashes and automobile accessories, we use a variety of malleable iron parts, which are tumbled in sawdust and plated with nickel direct upon the steel or iron. We have a large number of these parts fail in plating; the nickel peels off, and the surface of iron beneath appears black and greasy even after a very thorough cleaning previous to plating. Please consider our difficulty and advise us of proper procedure for correcting same.

Answer.—Malleable iron is very easily plated when clean. You can eliminate the failures from unclean surfaces by resorting to one of the following methods:

Use fine sharp sand for first operation in tumbling and finish by tumbling with clean sawdust. Clean tumbling material in any case means efficiency. The sand will remove the scale and gummy surface and the subsequent sawdust treatment will polish the steel. By treating the malleable castings in sawdust only you merely polish the surface of the scale and produce a greasy or gummy coating, which is only partially removed by strong alkalis or scouring. Electro-deposits will not adhere to such surfaces.

Another method is to proceed as you are now doing until the removal of the parts from the hot cleaning solution, when, instead of immediately rinsing in water, plunge the castings into a dilute solution of sulphuric acid and water. This operation requires but an instant and will effectively remove the scale and gummy substance and expose a clean metallic surface, which will permit further cleaning operations to be dispensed with. A trial in a small way will convince you of the merits of this method.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	$50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 62 00
Antimony	18 00
Copper, lake	32 00
Copper, electrolytic	32 00
Copper, casting	31 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 20
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 38
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 78
Linseed oil, boiled, single bbls.	1 42
Linseed oil, raw, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 15
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 9 50	$ 9 00
Sheets, black, No. 10.	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard buishings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 50%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to $0.54
Cobalt	1.75 to 2.00
Copper	.36 to .38
Tin	.86 to .88
Silver, per oz.	1.05 to 1.00
Zinc	.14 to .16

Prices per lb.

NAILS AND SPICES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .20
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.08
Ammonium, chloride	.11
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Arsenic, white	.10
Caustic soda	.07
Copper, carbonate, anhy	.50
Copper, sulphate	.16
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate .....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.46
Sodium cyanide, 98-100%	.38
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, singl and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.95
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 12
Tripoli composition	06 to 09
Crocus composition	08 to 12
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd.	0 43
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 55
Copper tubing, seamless	0 60

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	45
P H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

The General Market Conditions and Tendencies

TORONTO, Ont., Dec. 31.—The close of another year finds the industrial situation in Canada on the whole very satisfactory. Orders are plentiful, but supplies of raw materials are high in price and scarce in some cases. This latter feature is tending to restrict production, and the volume of trade is not as heavy as it would otherwise be. The scarcity of skilled labor has also handicapped manufacturers, and it is likely that the situation in this respect will become worse owing to the selective draft. The severe weather has revealed a serious shortage of coal in many parts of this province, causing considerable suffering and curtailing manufacturing operations. The severe cold has also practically cut off supplies of natural gas in some parts, principally in Western Ontario.

Steel

Quiet conditions prevail in the steel market, which is usual at this time of the year, and there is practically no change in the situation from last week. The demand for steel for commercial purposes continues light on account of the general slowing down of manufacturing activity, due largely to the difficulty that is being experienced in obtaining steel, particularly from the United States. The outlook for consumers of steel for commercial purposes is not very bright for the coming year, and it is likely that the output of a number of finished products will be considerably curtailed. Manufacturing operations cannot help but be restricted owing to shortage of raw material on account of the heavy and increasing demand for steel for war equipment. Plants engaged upon government work are in a class by themselves and are not suffering the same inconveniences that other plants are subject to. So many plants, however, of one kind of another are engaged upon government work that the apparent quietness in the market does not affect the situation to the same extent as in normal times. In other words, although the outside market is dull, there is a continuance of activity among industries engaged upon the production of munitions and other war supplies. The mills are busy and have more orders on hand than they can readily take care of, a large proportion of the business being government work in one form or another. The severe weather will interfere with mill operations and restrict the output to some extent, while it will also hinder the transportation of raw materials affecting principally those mills whose source of supply is in the United States.

The situation in regard to prices has been cleared up by an announcement that the present schedule will be extended for a certain period, probably three months. The War Industries Board, Washington, has recommended an indefinite extension of the price schedule fixed last September. It is expected that President Wilson will in the near future issue a proclamation extending the present schedule. Further recommendations have been made regarding fixed prices on a number of miscellaneous iron and steel products. The new list covers steel castings, railroad fastenings and track supplies, including spikes, angle bars, tie plates, etc., cut nails, and forging ingots. Some of these prices are as follows: Forging ingots at $73 per ton, splice bars and tie plates at 3.25c per pound, rail 3.90c, iron spikes at 4.50c, track bolts at 4.90c, and cut nails at $4 per keg, also fixing schedule on steel castings and cast iron pipe. Some of the above products had been gradually adjusting themselves to the new market basis, so that the formal announcement means no abrupt change.

Pig Iron

There is no improvement in the pig iron market; in fact, the situation has become more acute owing to the severe weather interfering with the movement of freight. In the United States the shortage of coke and fuel has become more acute and has further handicapped the production of pig iron and likewise steel. Now that the American Government has taken over all the railways there will doubtless be some improvement in the transportation situation, although it will take some little time before relief measures can become really effective. More furnaces have been banked and production has thus declined. There is no iron for nearby delivery and all reserve stocks have been exhausted. Fuel Administrator Garfield announced a few days ago that there would be no general revision of coke prices for the year 1918.

Scrap

The scrap market is stagnant and featureless. The fixing of prices in the United States of heavy melting scrap will make the market more settled here.

Machine Tools

The market has been quiet all the week on account of the holiday season, but a revival of activity will likely develop after the new year.

Supplies

The market is seasonably quiet this week, with prices generally holding firm. Cut nails, however, have declined 15c per 100 lbs., which makes the base price $5.65 per 100 lbs. An advance in lubricating oils is looked for principally on account of the increase in cost of tins and containers.

Metals

There is very little of importance to note in the metal markets this week, and there have been no price changes. The situation remains the same as last week, with business dull, which is usual at this season of the year. The copper market is quiet, with very little interest being shown by consumers. The tin situation is unchanged and continues acute on account of the scarcity of metal. Spelter is firmer, due to large purchases by the United States Government. Lead is quiet and demand light, although prices are firm. Antimony and aluminum are both quiet at unchanged prices.

Copper.—The copper market is now a routine affair and quite devoid of excitement. This is due to the fact that consumers are assured as to supply and of a uniform price. Spot copper, however, can only be had in small lots as distributed by jobbers. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The tin situation is unchanged and the acute shortage continues. Shipments are arriving from time to time, but are already sold into consumption long before arrival. Inquiry continues heavy, but in the absence of offerings trading is light and prices nominal. Local prices, 80c per pound.

Spelter.—The U. S. Government recently purchased a considerable quantity of grade C spelter, which has stiffened the market, although local prices continue unchanged at 10½c per pound.

Lead.—Prices are holding firm in spite of the quiet market and absence of demand. There is enough lead produced and in process of production to provide for all natural requirements and leave a sufficient surplus for private consumption so that exceptional prices should not prevail. Local quotations, 8½c per pound.

Antimony.—There is no change in the situation. The demand is quiet and price steady at 18c per pound.

Aluminum.—The marketi s quiet and quotations unchanged at 62c per pound.

Foundry Supplies and Chemicals

For the past few weeks business has been rather quiet in account of the holiday season and annual stock taking war requirements which are dominating the situation, are increasing in volume to the detriment of ordinary business.

Manufacturers of foundry equipment and supplies are being handicapped in the filling of orders for ordinary commercial purposes on account of the scarcity of the necessary materials. No improvements in the situation is anticipated, in fact conditions in the trade will most likely become worse.

The chemical market is quiet for the same reason as stated above and business is dull in so far as ordinary transactions are concerned. Government requirements are taking precedence over all other business and chemical manufacturers are engaged to a large extent in filling government orders.

◆

TRADE GOSSIP

Winnipeg, Man.—The Vulcan Iron Works, Ltd., will build an addition to its plant to cost $65,000. Tenders are being received by Woodman & Cubbidge, architects, 302 Lindsay Building.

Toronto, Ont.—The Canada Type Foundry has been granted a permit by the City Architect's Department for the erection of an addition to their factory at 70-72 York Street. The cost of the addition is placed at $18 000.

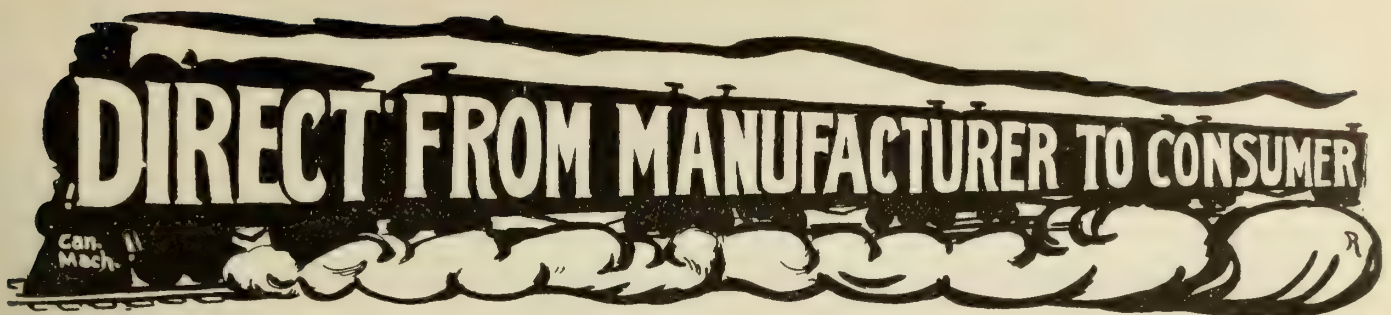
Douglas Bremner & Co. has been incorporated at Ottawa by W. S. Johnson, W. S. Wilson and A. R. Hall, all of Montreal to carry on business as civil and hydraulic engineers, foundrymen and machinists, etc., at Montreal with a capital of $50,000.

The Great Lakes Steel Corporation has been incorporated at Ottawa by Frank Regan, William N. Irwin, and E. J. Murphy, all of Toronto, to manufacture iron and steel products of all kinds at Owen Sound, Ont., with a capital of $1 000.000.

The Newell Manufacturing Co. has been incorporated at Ottawa with a capital of $45,000 to manufacture sheet copper, brass, steel, tinplate, etc., at Prescott. Ont. The incorporators are: Edgar A. Newell, William A. Newell, and Albert P. Newell, all of Ogdensburg, N.Y.

Electric Smelting Co., of Brantford, Ltd., has been incorporated at Ottawa with a capital of $45.000 to manufacture steel castings by the electric furnace process at Brantford, Ont. The incorporators are H. M. McIntyre, John Ker and Philip H. Secord, all of Brantford, Ont.

British Steel Concerns Merge.—A [illegible]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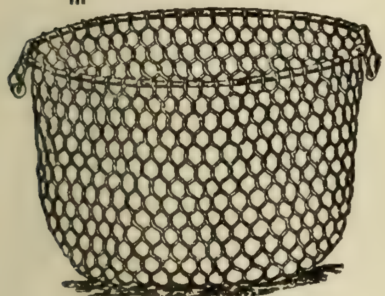

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It is 100% pure.

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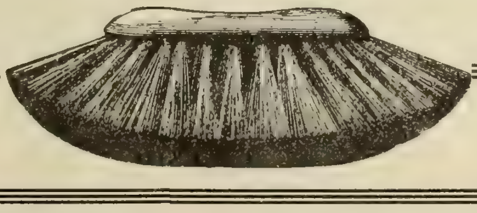
HAMILTON, ONTARIO, CANADA



es from London, England, state that arrangements have been made for the amalgamation of four prominent iron and steel companies—the Worthington Iron and Steel Co., of West Cumberland; the Phoenix Steel Works, of Rotherham; Samuel Fox and Co., of Sheffield, and the Frodingham Iron and Steel Co., of Lincolnshire. The capital will be at least £4,000,000 sterling. The total weekly output is about 25.000 tons of iron and 21.000 tons of steel.

EASTERN CAR CO. 1917 OUTPUT

THE Eastern Car Co., New Glasgow, N.S., has not been without a fair share of the manufacturing activity arising from railroad rolling stock contracts placed during the present year. A total of 4,640 freight cars have been built and shipped, outstanding features being that the majority were to foreign order and all were of steel frame construction. The shipments were as follows:

Paris-Orleans Railway, 1,600 box cars of 20 tons capacity.

French State Railway, 540 gondola cars of 20 tons capacity.

Russian Imperial Government, 2,000 box cars of 1,200 pood capacity.

Canadian Government Railways, 500 box cars of 50 tons capacity.

METAL PRODUCTION IN CANADA IN 1917

THE Department of Mines estimates the production of metals from Canadian ores in 1917 as follows: Gold, 17,000,000 ounces; silver, 23,500,000 ounces; copper, 113,000,000 pounds; nickel, 84,800,000 pounds; lead, 56,700,000 pounds; zinc, 31,000,000. The production of pig iron was about 1,186,000 short tons, and steel ingots and direct steel castings 1,735,000 short tons. The production of coal was about 14,100,000 short tons. The production of gold, silver, copper and coal was less than in 1916. The production of nickel, lead, zinc, pig iron and steel was greater than during the previous year.

Higher prices received for silver, coal and other products considerably enhanced the total value of the mineral production. It is estimated to have been not less than $200,000.0000, as compared with $177,201,534 in 1916.

WAR HAS DEVELOPED MOLYBDENUM PRODUCTS

THE demand for molybdenum for use in the manufacture of special steels has greatly stimulated prospecting and development of our molybdenite resources. Numerous discoveries have been made which vary in importance from mere mineral occurrences to deposits which have already given considerable production. The most important deposit yet proven is that near the village of Quyon, Quebec.

The Federal Department of Mines has done much to encourage the concentration of these ores. After trial shipments had been made for test runs in the United States, the ore from Quyon mine was principally sent to the concentrating plant of the Mines Branch. The company has recently completed a concentrating plant to take care of their output.

POWDERED FUEL

A LARGE proportion of Canada's reserves of coal is unsuitable for use in the ordinary way as locomotive fuel. The coals of Manitoba, Saskatchewan and portions of Alberta are lignite or sub-bituminous, high in moisture, and owing to excessive "sparking" cannot be used as locomotive fuel because of their liability to set fires. There is a possibility that pulverization will overcome the disabilities of this type of fuel, and W. J. Dick, mining engineer of the Commision of Conservation, is investigating the problem and compiling information respecting the use of powered coal and peat as a fuel for locomotives, stationary boilers, cement plants and metallurgical purposes. This class of fuel has already been used with economic success in a few plants. If it can be proven to be a sucess generally, it will mean that we can utilize much low-grade coal that, heretofore, has been largely wasted, and will lessen the ever-increasing cost of generating power from high-grade coals and fuel oil.

CANADIAN FURNACE CO., 1917 OUTPUT

DUE to the scarcity and high price of pig iron during the year, it may perhaps be superflous to state that the plant of the Canadian Furnace Co.. at Port Colborne. Ont., has been operating to capacity in the twelve-month period. Only foundry and malleable pig iron are produced and of these commodities the total out for the year on a close estimate is 109,000 gross tons, all of which was sold to Canadian consumers. Due to the continuance of abnormal metal-working plant activity, the outlook for the coming year is of the brightest possible description.

BRONZE FINISHED BUTTONS

ARMY buttons are made from solid copper with a brass screw back fastener. The finish is a rich dark brown tone without lustre. Navy buttons are made from brass and finished in ormolu gold by a combination of mercury or fire gilding and electro-gilding.

In producing the military bronze finish, unless the button and fastener are made entirely of copper, they must be copper-plated, says Charles H. Proctor in "The Metal Industry." After plating the buttons are washed and dried. A saturated solution of copper nitrate is prepared by dissolving all the copper nitrate possible in water heated to 180 degrees. The buttons are then placed in a tumbling barrel, revolved at from 4 to 6 revolutions per minute, and a sufficient amount of the copper nitrate solution applied so the buttons will be covered uniformly by rotation. An excess of the copper nitrate should be avoided or the buttons will come out patchy in the final finish. After tumbling for a few minutes the buttons will have a dark stained appearance.

Remove the buttons and place upon sieve pans made from iron wire mesh, then heat the buttons to a temperature of 700 or 800 degrees in a closed retort with provisions for carrying off the smoke fumes. After the smoke fumes have all been eliminated the heating operation is finished and as a result the copper nitrate is converted into brownish black oxide of copper, which proves to be a permanent finish.

* * *

AN important activity of the American Society of Mechanical Engineers is its work in co-operation with government bureau chiefs and manufacturers in securing and maintaining uniform standards in gauges used in the production of guns, ammunition, motor trucks, aircraft and other war material, and a public meeting of its gauge committee, held recently, was largely attended by manufacturers and their representatives.

* * *

ALCOHOL is made from the cheapest starchy materials available, such as potatoes, maize, turnips, molasses. The raw material is mashed with about 5 per cent. of malt. and fermented in the usual way. After distillation in a Coffey still, the spirit is diluted with water, filtered through wood charcoal to remove fusel oil and redistilled through a fractionating column. The products are separated into three grades: first runnings, and first and second quality spirits. The first runnings, containing about 95 per cent. of alcohol with a small quantity of aldehyde, may be used for burning and give rise to no deleterious effects. The first and second qualities, which are 96 to 97 per cent. in strength and contain only traces of aldehyde—the second quality also containing a small quantity of fusel oil—are known as silent spirit.

CANADIAN CAR & FOUNDRY CO. 1917 OUTPUT

Railroad or Company	Number	Type	Capacity Pounds	Car Body Steel, Steel Fr. or Wood	Underframe Steel Comp. or Wood	Draft Rigging Fr. or Sp.
Can. Government Railways..	5,000	Box	80.000	Comp.	Steel	Spring.
Can. Government Railways..	1,000	Stock	60.000	Wood	C.S. Dr. Sills	Spring.
Russian Government	2,000	Box	1,200 Pood	Comp.	Steel	European
Temiskam'g & Nor. Ont. Ry.	100	Box	80.000	Comp.	Steel	Friction
Essex Terminal Co.	50	Ballast	80.000	Wood	Comp.	Friction
Paris & Orleans	850	Gondola	30.000	Comp.	Steel	European
Can. Government Railways..	500	Box	100.000	Comp.	Steel	Spring.
Can. Government Railways..	20	Sn. Pl.		All Steel	Steel	Spring.
Can. Government Railways..	200	Box	60.000	Wood	Comp.	Spring.
Quebec Central Ry.	100	Box	60.000	Wood	Comp.	Spring.
Anglo Newfoundland Co.....	12	Flat		Wood	Wood	Spring.
Anglo Newfoundland Co.....	12	Box		Wood	Wood	Spring.
Moncton & Buctouche Ry...	1	Sn. Pl.		Wood	Wood	Spring.
Can. Steel Foundries	15	Ingot		All Steel	Steel	Link & Pin
Reid Newfoundland Ry.	50	Box	40.000	Wood	Wood	Spring.
French State Railway	1,000	Gondola	40.000	Comp.	Steel	European
Can. Government Railways..	100	Refrig.	80.000	Wood	Comp.	Spring
Can. Steel Foundries	12	Flat	80.000		Steel	Spring.
Can. Car & Foundry Co	8	Flat	80.000		Steel	Spring.

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MacLean's Magazine

for JANUARY

Chasing the Submarine---by a Canadian

A CANADIAN, whose name is withheld, in the Motor Boat Patrol Service in the North Sea, tells in the January MACLEAN'S the story of the work and life and triumphs of the Service to which he is attached. It is a fine performance by MACLEAN'S to get this story for the Canadian people. Successes of this sort have made MACLEAN'S go far forward in public favor during past months.

If the horrid and terrible submarine warfare and the conquest of this pest of the deep interest you, learn more about submarines and their capturing in the January MACLEAN'S, and pass on to others the news of this unsigned contribution.

Ships---more ships---and yet more ships

THIS is a very strong article which Miss Agnes C. Laut contributes. As usual she is very well informed. Regarding the duration of the war she voices American opinion when she says that it is likely to be long drawn-out. The United States people are buckling down to a stern struggle. At this time we want very much to read what well-informed, virile thinkers and writers have to say about the war, since things are not any too bright in certain directions. Miss Laut has a good deal to say about the shipping programme of the United States, and certainly she gives facts and sets us thinking as few writers do.

"Jim" by Robert W. Service

A POEM by this strong poet—a poem wrought amid the smoke and hell of battle, yet fanciful and tender One wonders how men can write fanciful verse amid surroundings that seem so adverse to thinking and writing, yet some gifted can detach themselves and let fancy play; or is it that their minds see through the real and horrible—through the immediate environment into inner things? Whatever it may be, we ought to be glad for the verse that men like Service give us, remembering how and where it is produced.

Adam and Arthur William Brown, Brothers

ADAM BROWN is a Canadian short story writer of large promise. His brother, Arthur William, is one of New York's foremost illustrators. Both brothers have joined their gifts to make Hannibal Helps a mighty good feature of the January MACLEAN'S.

A New Serial by Alan Sullivan

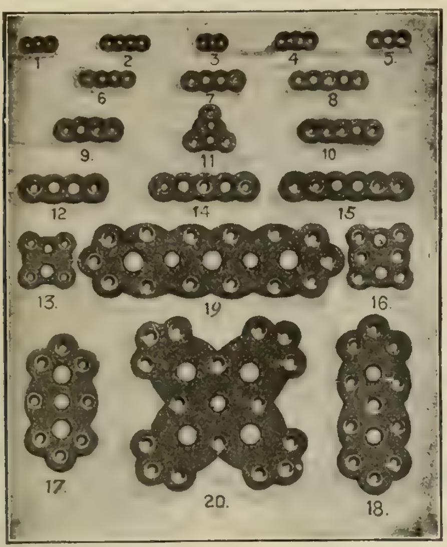
ALAN SULLIVAN'S recent novel, The Inner Door, is being well received. Perhaps we have no better novelist of his type in Canada to-day. He writes books that show introspection and fine analysis. This serial, The Magic Makers, adds venture and mystery to psychological study, and is a rare good thing. Arthur Hemming illustrates the story, which begins in Scotland and is transferred to Canada where the stage is set.

The Regular Departments of MacLean's

REVIEW of Reviews, Women at Work, The Business Outlook—are present in goodly measure. Oppenheim's The Pawns Count, Trench Pictures, and first-class illustrations by artists of note help to make the January MACLEAN'S good value for money.

At All News Stands, 20c

Obermayer Rapping Plates and Lifters



Our Rapping Plates and Lifters are the best made from Malleable Iron. Smooth, true, straight, accurately machined and tapped.

Complete stock in all our Warehouses

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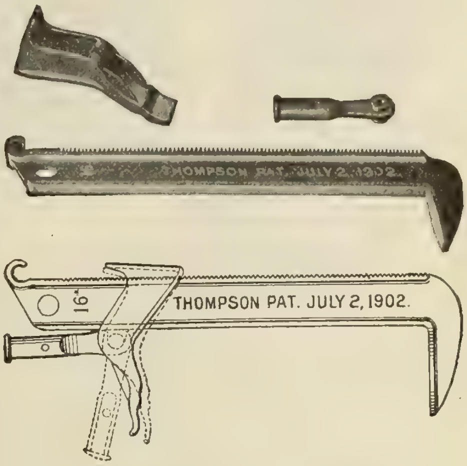

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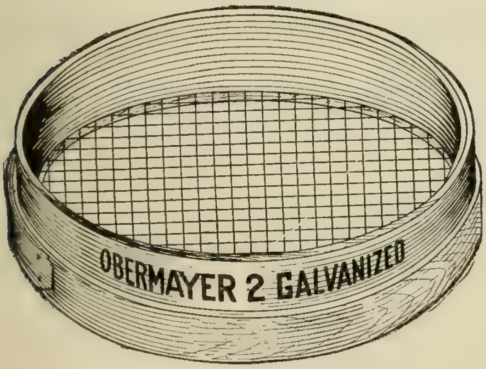

The strongest, heaviest and best made Riddles on the market.

Rock Elm Rims

Full Specifications Furnished on Request

Made in Heavy Galvanized and Brass—16", 18", 20", 21", 22" diameter.

Complete stock in all our Warehouses

Obermayer National Iron Filler Cement

Repair Defective Castings with National Iron Filler Cement

With a can of this cement handy there is no use scrapping castings because of blowholes, cracks and other unsightly defects. It's a very easy matter to repair such blemishes by simply mixing a quantity of National Iron Filler Cement with a little water and applying this with a knife.

The cement settles in a few hours and becomes as hard as the iron itself, and you cannot tell that the casting has been repaired. In 12-lb. Tin Cans and 100-lb. kegs. Free Samples on application.

Stock in all our Warehouses

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Manufactures Everything You Need in Your Foundry

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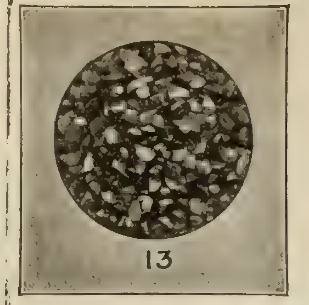
Chilled Shot



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Diamond Grit

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Metallic Abrasives

Dustlessly Chilled Shot and Diamond Grit clean iron, steel, malleable brass and aluminum castings. With the passing of every year they add to their enviable reputation of 1887 for thorough cleaning with greatest economy. Both are used in every quarter of the world.

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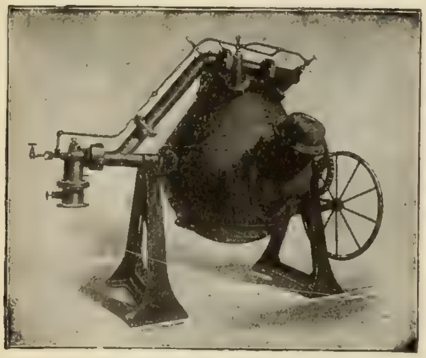

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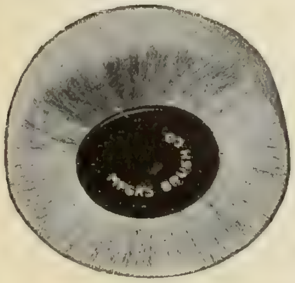

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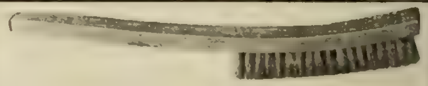

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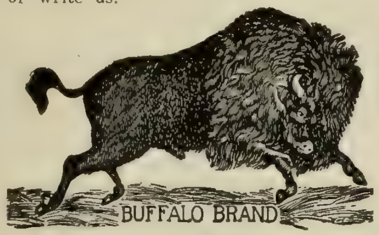

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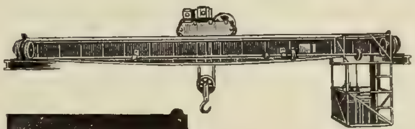

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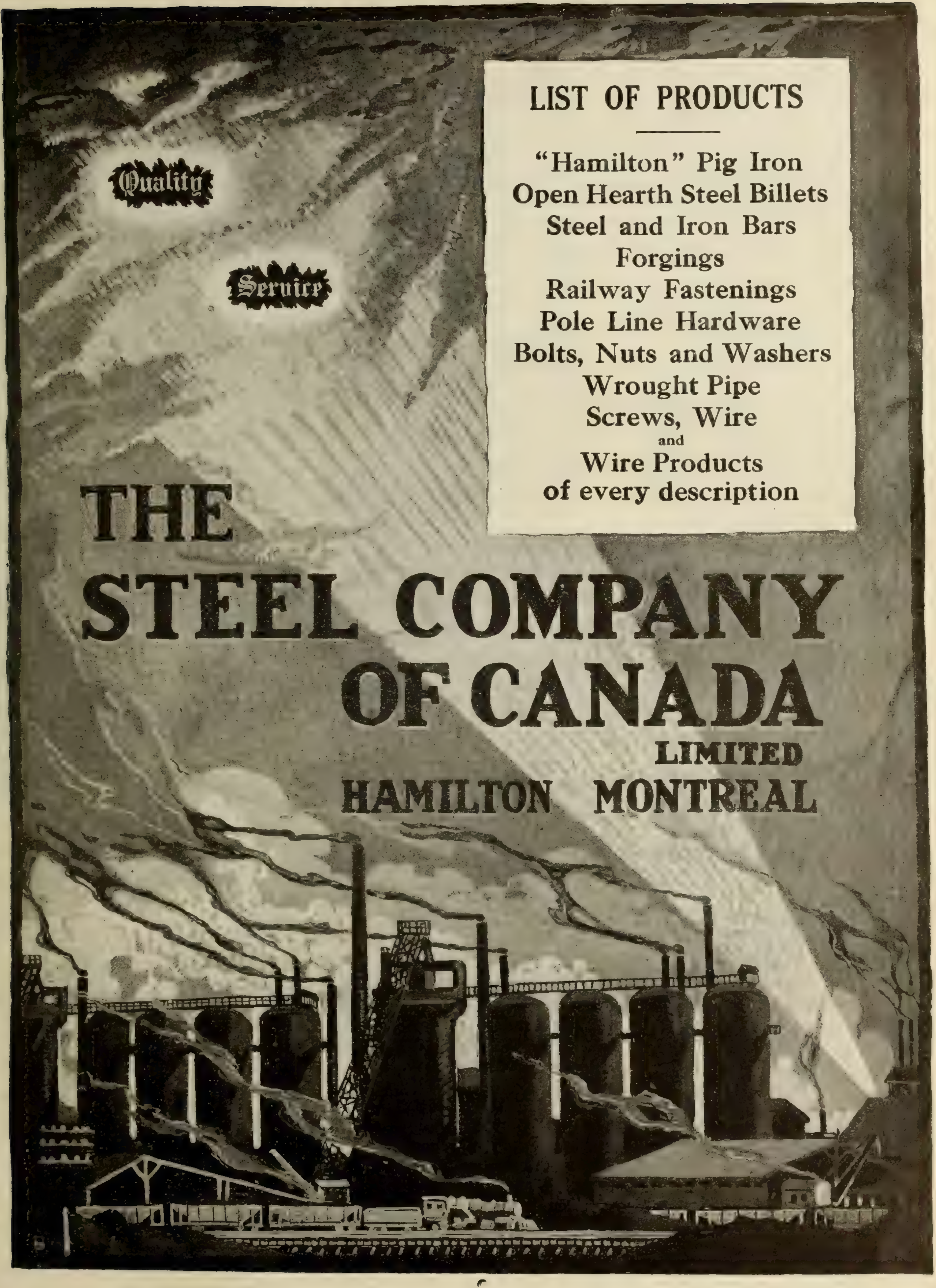

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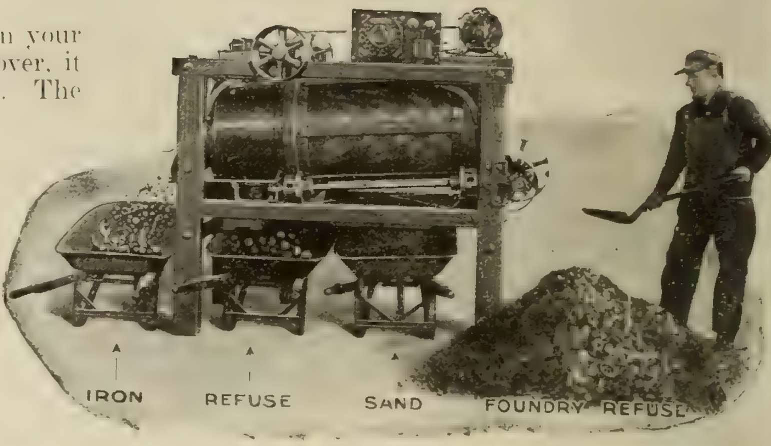

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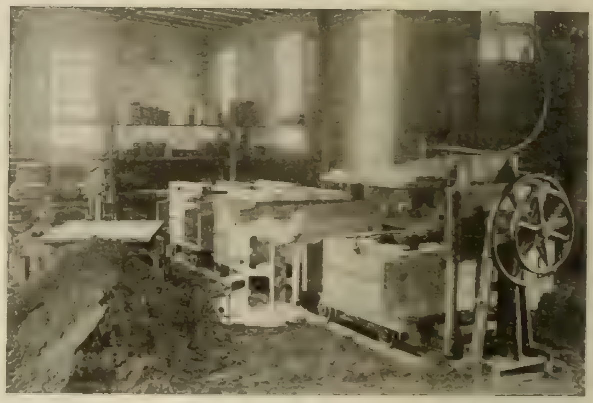

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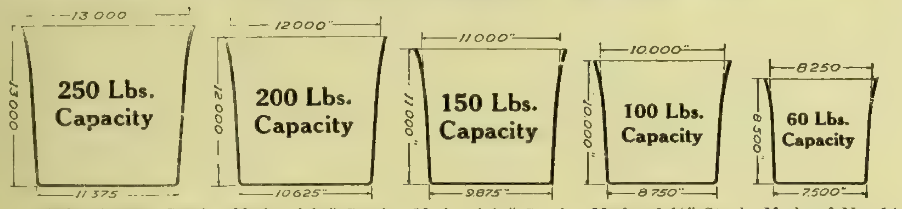

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That is just what hundreds and hundreds of foundrymen have already found out from the trial and service of my New Style Stamped Steel Ladle Bowls. From the Atlantic to the Pacific these Bowls are used in preference to any others and repeat orders are coming in continually. There is every reason why YOU, as well as others, should take advantage of this NEW Ladle construction. You have only to look into it yourself. See them. I make it easy. Am just now sending out samples by express, prepaid. Let me send yours at the same time. Write me to-day. Ask for a sample Bowl.

And Let Me Send You One of these Shanks at the Same Time

These are made with extra heavy cast steel band—instead of forged band—which makes them twice as strong—ONE HUNDRED PER CENT. STRONGER than the old kind.

No breakage—no accidents—long life. Steel foundries—as well as other foundries—swear by them.

Made in the styles shown in the illustration. Am also sending out samples of shanks. Write for a sample Shank at the same time you ask for a sample bowl.

Single End Shank

Double End Shank

Double End Swivel Shank

FREDERIC B. STEVENS

Manufacturer Foundry Facings and Supplies, Buffing Compositions and Platers' Supplies

FACING MILL: Corner Isabella Avenue and M.C.R.R.
WAREHOUSE and OFFICE: Corner Larned and Third Street
EXPORT WAREHOUSE: Windsor, Ontario
NEW ENGLAND BRANCH: Frederic B. Stevens, Corner Water and Olive Streets, New Haven, Conn., E. E. Seeley, Manager

DETROIT, MICHIGAN

BRANCH: Hoosier Supply Co., Indianapolis, Indiana

Manufacturing Plant

Canadian Hanson & Van Winkle Company, Ltd.

Anodes

NICKEL
BRASS
COPPER
BRONZE
COBALT
ZINC

Purity Guaranteed

Electro-Plating, Polishing Materials

Our large manufacturing facilities with modern equipment enables us to give prompt attention to all orders.

Compositions

IDEAL
(LIME FINISH)
TRIPOLI
CROCUS
ROUGE
EMERY CAKE
BUFFS

Everything for Polishing

Equipment

We make a specialty of installing Electro-plating and Polishing Equipment. Consult us and we will gladly work out your problems.

Chemicals

Acme Mineral Cleaner, Kostico, Royalite, Galvanizing Salts, Nickel Salts, Copper Carbonates, Cyanides, Pickelene, etc.

Supplies

As all our supplies are now made in **Canada**, we are able to give you special materials to suit your particular class of work.

BUY GUARANTEED QUALITY MATERILALS

They Pay in the Long Run

Canadian Hanson & Van Winkle Company, Limited

TORONTO, CANADA

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, FEBRUARY, 1918 No. 2

A Manufactured Product

Better Than Natural Sand

One Car of FLINT SHOT

goes as far as TWO cars of natural sand.

Think what that means!

Because FLINT SHOT is cleaner, harder, more uniform than natural sand-blast sands, it goes twice as far—does twice as much work before it wears out.

This cuts your sand *freight bill* in two; conserves cars, locomotives and railroad fuel.

Then, in your shop, it saves your *air*-cost, labor-cost, power-cost and greatly increases your output per man per day.

All these savings *dwarf* the extra cost of this superior product, freight included.

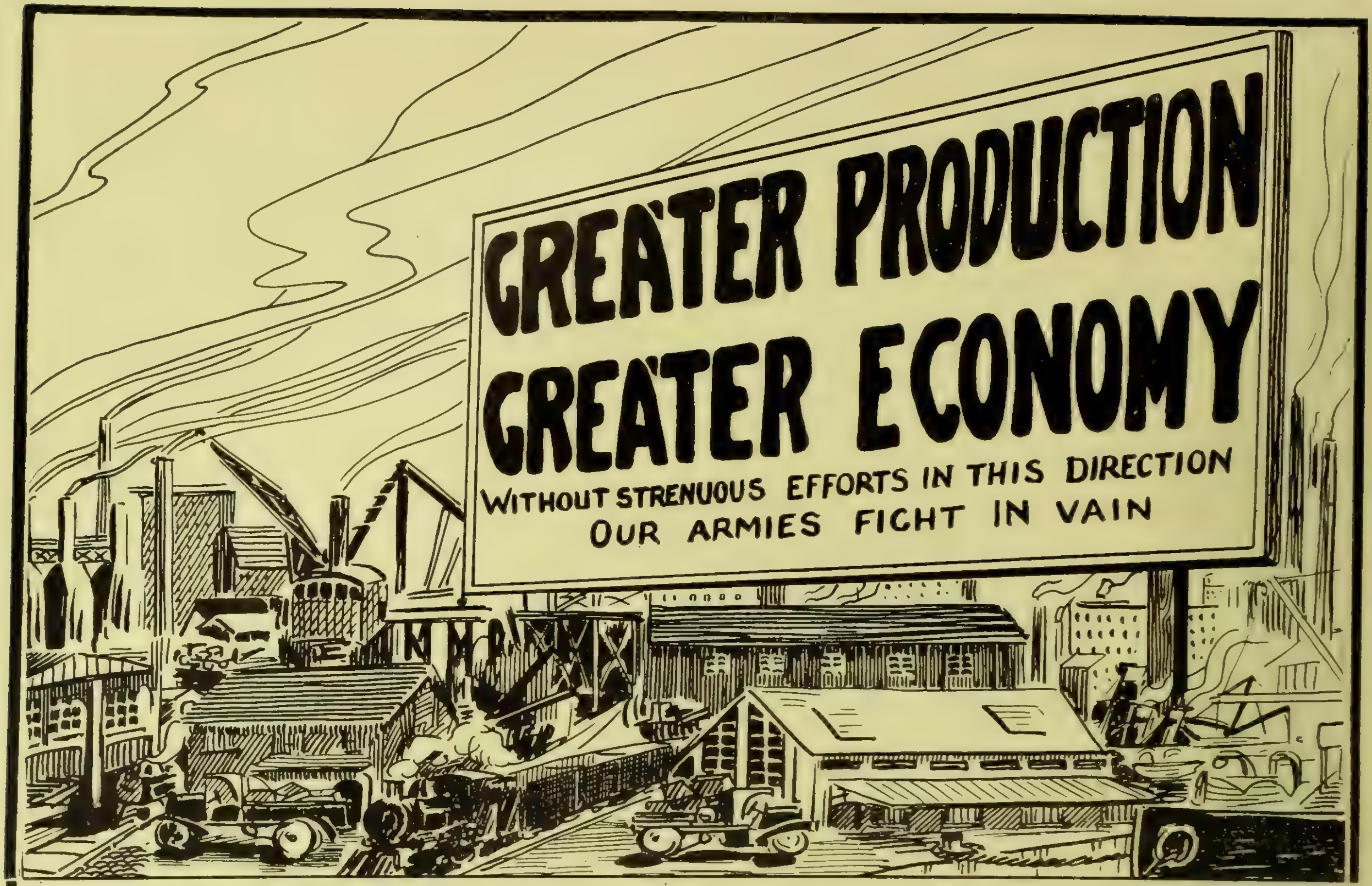
And, on top of these *savings* you secure a more *perfectly-cleaned* product—a vital consideration, especially in munitions.

Send for an envelope-sample and ask for our Book—"Little Journeys of the Flint Shot Man."

United States Silica Company

Sole Producers of Flint Shot

414 PEOPLES GAS BLDG. - CHICAGO


GREATER PRODUCTION
GREATER ECONOMY
WITHOUT STRENUOUS EFFORTS IN THIS DIRECTION OUR ARMIES FIGHT IN VAIN

KAWIN Service Paves the Way!

War has become greatly a thing of economics, of **commerce**, of **industry**.

Therefore **greater production** and greater **economy** are twin factors of your business which it behooves you to study and practice with the utmost zeal in the interests of the allied cause. The men who guide the nation's affairs have emphasized and given much publicity to this vital necessity.

Are you doing your best to **produce** and **economize?**

You may be doing your best—but there is not much doubt that the expert help that the KAWIN SERVICE can give you would advance your production and put your business on a more economical running basis than is the case at present.

KAWIN SERVICE sends an expert, practical foundryman to your plant; he devises the best moulding and cupola practice; advises the best means of purchasing raw materials and in a dozen different ways shows you the best route to bigger and more economical production.

SPECIAL—Kawin Service is growing. An **Industrial Engineer** of high repute, a **Practical Foundryman** of broad experience, and a **Fifth Laboratory at Buffalo, N.Y.**, are being added to our service. All of which our Canadian Clients will share in the benefit. Full details later.

100 % Results or No Charge

KAWIN SERVICE is guaranteed to save you one hundred per cent. over and above its cost.

Have our representative call upon you to explain the details. Write.

Charles C. Kawin Company, Limited

Chemists, Metallurgists, Foundry Advisers - 307 Kent Building, Toronto
Chicago, Ill. Dayton, Ohio San Francisco, Cal.

See Next Issue Regarding Details of Our Buffalo Laboratory

ATLAS BLACKING

"Made in the House that WOODISON built"

Will not rub off—Stays where you put it—Lays nicely to the metal—Peels perfectly. Remains in suspension so does not settle or require constant mixing.

Cost is nominal—Results obtained prove superiority—Best for Cores, Dry Sand and Loam work.

ORDER A BARREL ON APPROVAL

The E. J. WOODISON COMPANY

Toronto Montreal Windsor Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle

The Publisher's Page

TORONTO February, 1918

A true word well spoken

WE received a day or two ago a blotter calendar—from one of our advertising friends. It is of fine quality, the printing good and the color pleasing. It is the message which the blotter conveys, however, which makes it unusual and interesting. Here it is:

> **American business men do not realize the value which trade journals and technical magazines might be to them in increasing their efficiency and in giving them a broad and comprehensive view of their business. Our foreign competitors read almost every article published upon their business with great care and thoroughness. Our trade journals and technical papers are the best in the world and they should be encouraged and supported by our business men.**
>
> **"These papers are preaching the gospel of sound business on practical lines and are helpful, not only to business, but to the country as a whole. If the suggestions made by them in the past had been followed by our business men it would not be necessary at this time to point out some of the fundamental weaknesses in American business."**
>
> **Adapted from the book, "Awakening of Business," by Edward N. Hurley, Chairman of the Federal Shipping Board.**

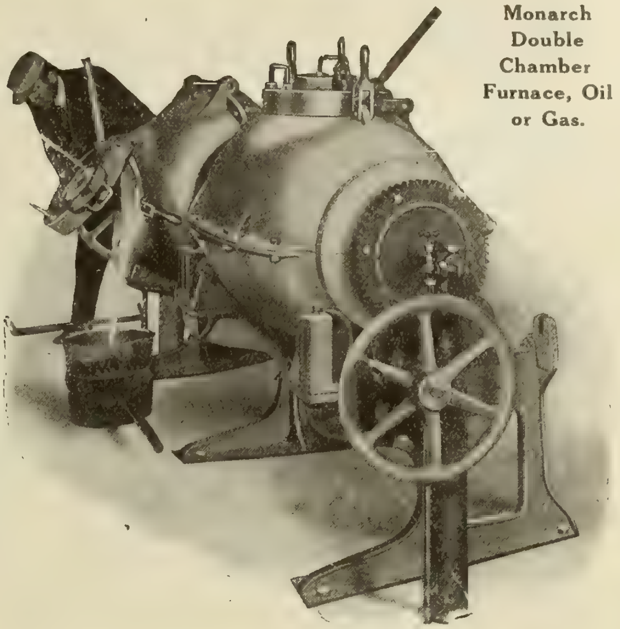
The following excerpt from the letter which accompanied the blotter in question is equally interesting explaining as it does the reason why the advertiser spends his good money on expensive advertising to "boost" as he says the technical journal. The letter was written by the general sales manager and his name and the name of the concern he represents, though withheld here, will be supplied upon request.

> Several people have asked me why I am "boosting the game" of the trade papers. They find it difficult to understand just how I expect to sell our product by getting people to read the technical journals; and many of them think me a fool for spending hundreds of dollars of my company's money to distribute these blotters. * * *
>
> My position in this matter is taken because of a very firm conviction that the people who read the trade papers are much better business men and hence easier to sell a good product to, than the men who do not read the trade papers. I have studied this question for several years and do not think that I ever found a man consistently reading the trade papers who was not a "live wire" and the sort of fellow I like to do business with.
>
> On the other hand, I have found that the men who do not read the trade journals are unprogressive, addicted to haggling over trivial points and, on the whole, very hard to do business with. The people who read the business papers know what's what, and, in selling them, it is not necessary to spend hours of valuable time in the discussion of elementary points.
>
> My attitude in this matter is possibly an unusual one, but I am firmly convinced that it is the right attitude. Furthermore, I believe that if my ideas on this subject were brought to the attention of the people selling goods in the marine field many of them would see the matter in a new light and would actively co-operate with you in getting your publication into the hands of, even more, the men to whom they wish to sell.
>
> The trade papers are doing a wonderful work; and every good business man should boost them all he can all the time.

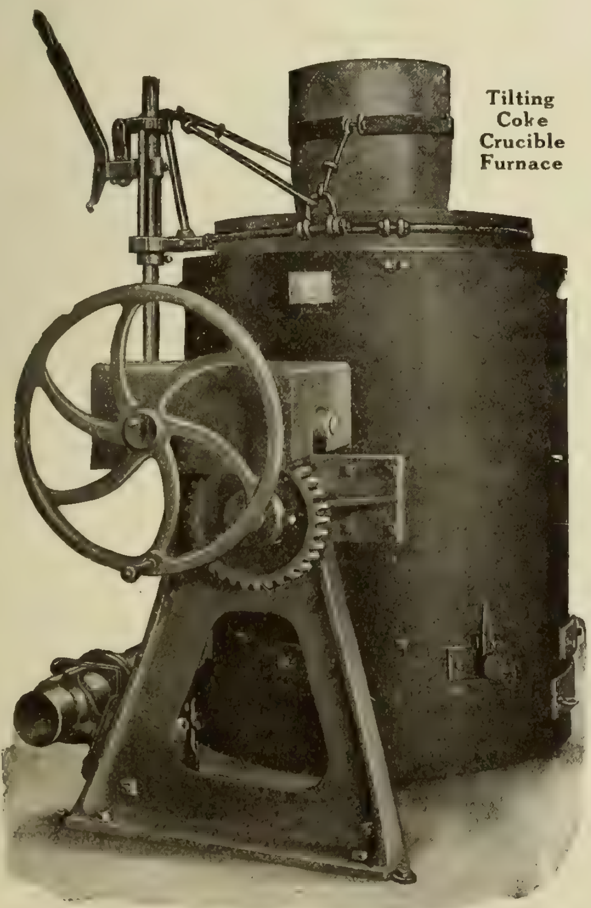
MONARCH MELTING FURNACES

Are built by pioneer furnace makers by men who know all that is known about metals and whose knowledge of foundry conditions of to-day is the most intimate. Therein is the reason why Monarch Furnaces have moulded the way to vastly greater furnace efficiency and are the first to radically lower melting costs.

There is a type of Monarch Furnace for all metals, for all fuels, that you can use with greatest profit.



Monarch Double Chamber Furnace, Oil or Gas.



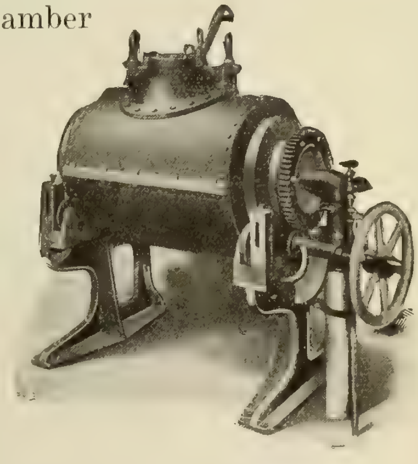
Tilting Coke Crucible Furnace

Hopper feed, above ground, shake grates, all size crucibles.

50% More Economical

"Monarch Rockwell" Double-Chamber Furnace without crucibles melts almost twice as much metal as any other furnace **without additional cost for fuel.** It utilizes all the heat from its one burner. While melting in one chamber, exhaust heat brings the metal in the other chamber to the melting point.

We'd like to tell you all that the exclusive Monarch features of these three illustrated furnaces mean in earning ability. We'd like to show you what these "Monarchs" are doing in money-making foundries in the States and Canada.



Monarch Rockwell Single Chamber Furnace—"Simplex"

FOR CATALOG CF1 1918

WRITE

The Monarch Engineering & Manufacturing Company

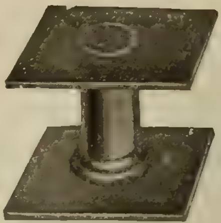
1206 American Bldg., Baltimore, Md., U.S.A.

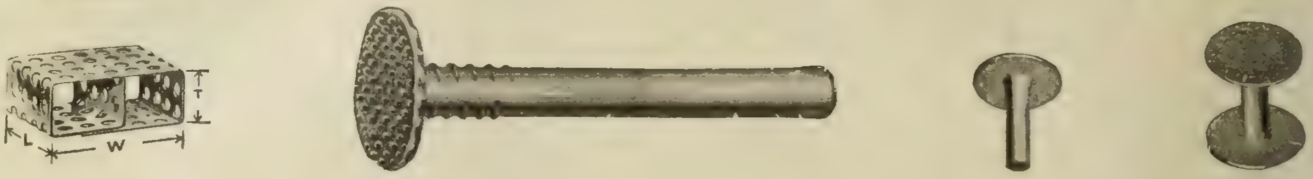
SHOPS AT CURTIS BAY, MD.

Foundry Chaplets

of every description

Forged, Riveted and Electric Welded





Hard Iron Tumbling Stars

Made of a Special Grade of Iron for the Tumbling Barrels.

We take care of You

The Fanner Mfg. Company

Cleveland - Ohio.

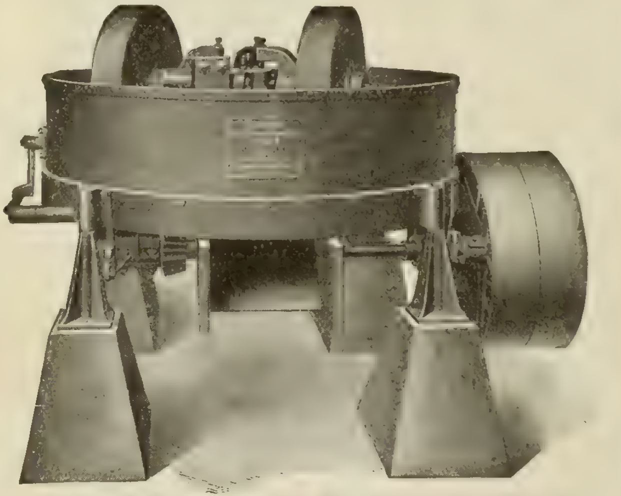
Mark Inquiries Dept. C.

A Message to Canadian Foundries

THE SIMPSON
INTENSIVE FOUNDRY MIXER

Saves Both Sand and Labor

Improves the quality of the castings.
Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.

Write for details and prices to

National Engineering Co.

Room 505, Tacoma Bldg.
CHICAGO, Ill.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the best possible wheel for the purpose.

Gresolite
for Grey and Chilled Iron.

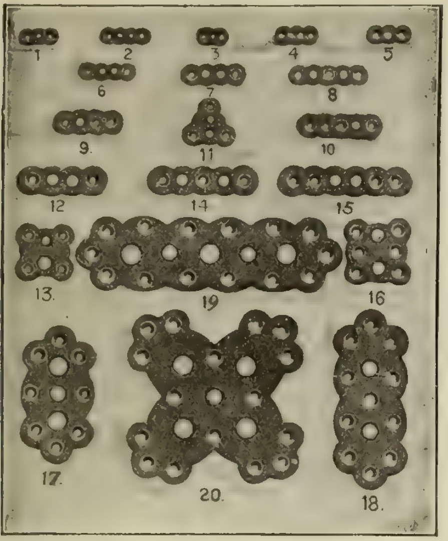
Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

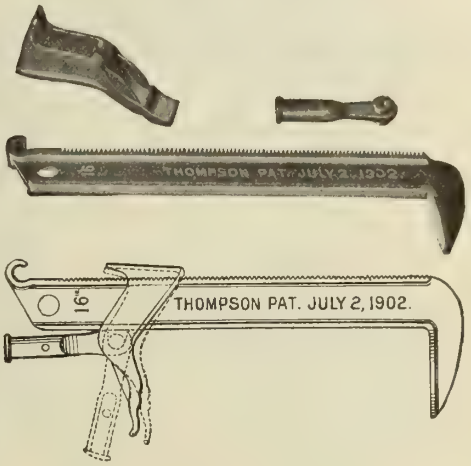
Obermayer Rapping Plates and Lifters



Our Rapping Plates and Lifters are the best made from Malleable Iron. Smooth, true, straight, accurately machined and tapped.

Complete stock in all our Warehouses

Thompson's Patent Adjustable Malleable Iron Flask Clamps



Seven Sizes—10 to 42 inches

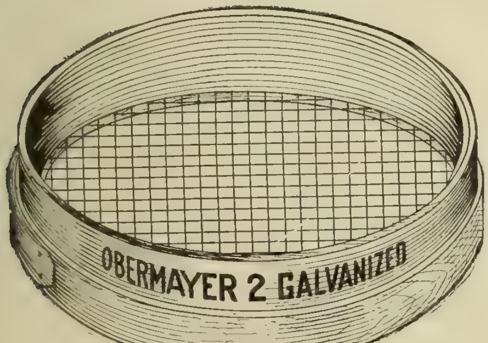
Practically Indestructible

Cost no more than the ordinary kind.

Complete stock in all our Warehouses

OBERMAYER

"Esso" Quality Foundry Riddles



The strongest, heaviest and best made Riddles on the market.

Rock Elm Rims

Full Specifications Furnished on Request

Made in Heavy Galvanized and Brass—16", 18", 20", 21", 22" diameter.

Complete stock in all our Warehouses

Obermayer National Iron Filler Cement

Repair Defective Castings with National Iron Filler Cement

With a can of this cement handy there is no use scrapping castings because of blowholes, cracks and other unsightly defects. It's a very easy matter to repair such blemishes by simply mixing a quantity of National Iron Filler Cement with a little water and applying this with a knife.

The cement settles in a few hours and becomes as hard as the iron itself, and you cannot tell that the casting has been repaired. In 12-lb. Tin Cans and 100-lb. kegs. Free Samples on application.

Stock in all our Warehouses

The S. Obermayer Co.

Manufactures Everything You Need in Your Foundry

Chicago Cincinnati Pittsburg St. Louis Denver Los Angeles

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

English Moulding Machines

"Jarr" Ramming
"Head" Ramming
"Hand" Ramming

The most efficient on the market.
Well built to suit rough usage.

Write for particulars to the makers.

Britannia Foundry Company
Coventry, England

THE STANDARD IN

CRUCIBLES

Manufactured For Over 50 Years

J. H. Gautier & Co.

JERSEY CITY, N.J., U.S.A.

USE
KAOLIN

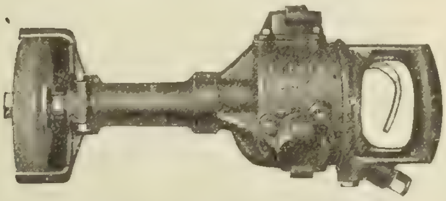
For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

It will save your fire brick and the time of your men.

Whitehead Bros. Co.

Providence
New York
Buffalo

"Little David" Grinder in the Foundry.


No. 7 "Little David" Grinder.

The "Little David" Grinder

makes for money-saving and foundry efficiency.

It is particularly rugged and will stand up under the hard usage such a tool generally receives.

The "LITTLE DAVID" Grinder contains nearly one-third less parts than any similar machine now on the market. This means simplicity and the least possible number of repair parts to provide for. The entire motor runs in a bath of oil, reducing friction and insuring the longest wear.

For some classes of work an extension shaft is provided, 21 inches long, which adds greatly to the usefulness of the tool.

Send for bulletin on "Little David" Drills, Grinders, Chipping Hammers, etc., also "Imperial" Hoists and "Crown" Sand Rammers.

CANADIAN INGERSOLL-RAND CO., Ltd.

General Offices: Montreal, Que.

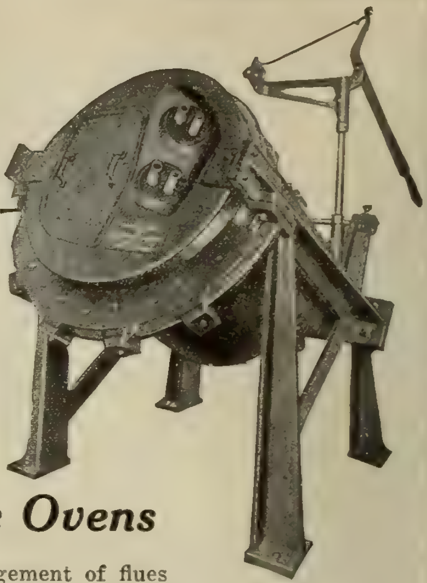
Branches:
Sydney, N.S.
Sherbrooke, Que.
Montreal, Que.
Toronto, Ont.
Cobalt, Ont.

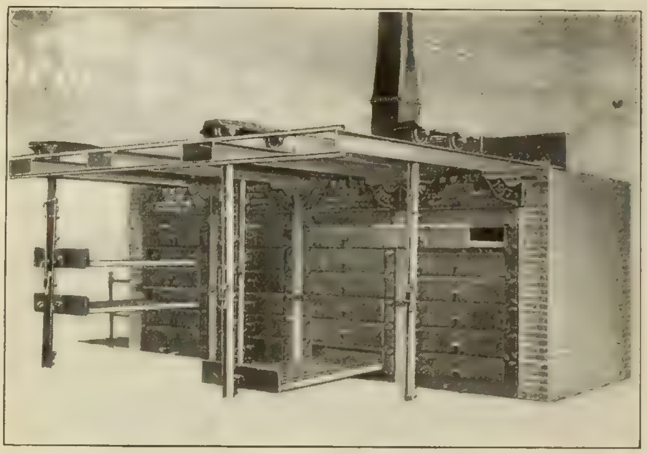
Branches:
Timmins, Ont.
Winnipeg, Man.
Nelson, B.C.
Vancouver, B.C.
New York, N.Y.

SLY Sand Blast

Sand Blast Mills
Sand Blast Rooms
Sand Blast Cabinets
Sand Blast Rotary Tables
Sand Blast Pressure Machines
Sand Blast Special Equipment
Sand Separators

30 years' experience. Let us solve your sand blast problems.





Drawer Type Core Ovens

Simple arrangement of flues
Low fuel consumption
Yearly output doubled
Continuous operation
Ovens do not warp
Rigid construction
Even heat distribution
Oil, coke or gas firing
Variable drawer sizes
Easy operation
No breakage of cores
Satisfaction

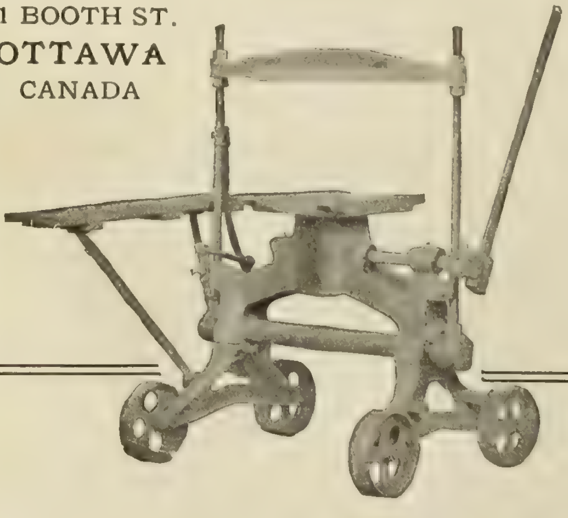
The W. W. Sly Manufacturing Co. Cleveland, Ohio, U.S.A.

B&B

HAND, JAR & SQUEEZE MACHINES

These machines are built in Stationary and Portable type. The stroke of the table is 2½". They are built to stay right and for quick and perfect work. We also make Power Molding Machines. For information and prices write

Castings of Ottawa Ltd.
51 BOOTH ST.
OTTAWA
CANADA



GLOBE

Shot Blasting
Instead of Sand Blasting
Ensures 100%
Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

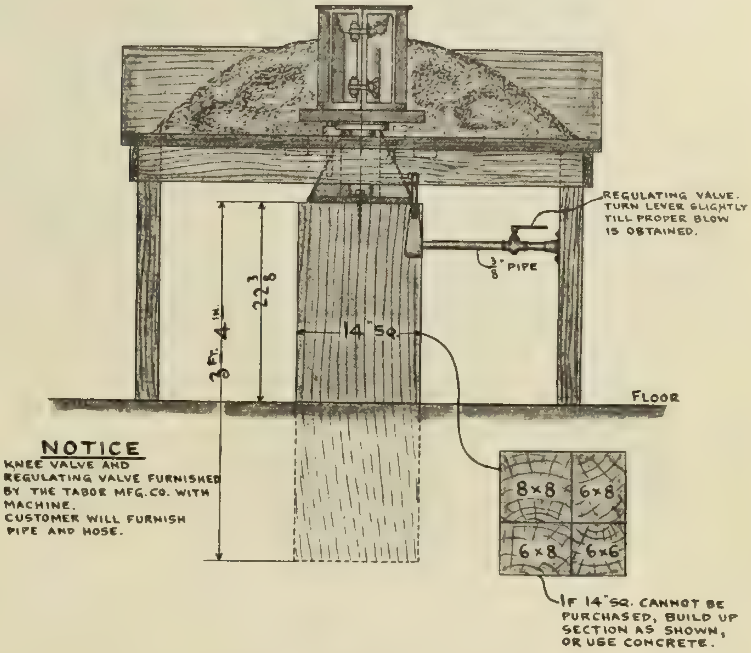
SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

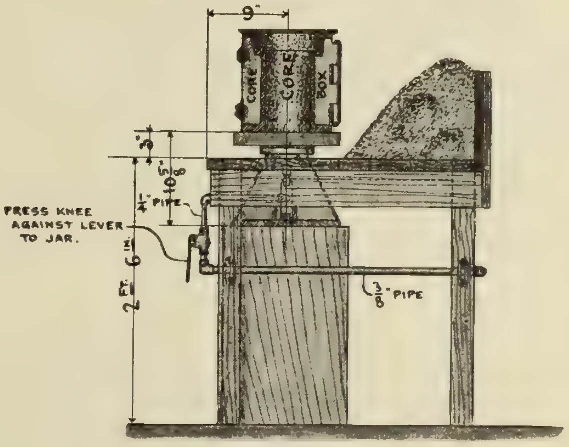
THE GLOBE STEEL CO.
MANSFIELD, OHIO

TABOR

3" Tabor Jarring Machine with 12" x 14" Table.


REGULATING VALVE. TURN LEVER SLIGHTLY TILL PROPER BLOW IS OBTAINED.
3/8" PIPE
22 3/8
3 FT. 4 IN.
14" SQ.
FLOOR
NOTICE
KNEE VALVE AND REGULATING VALVE FURNISHED BY THE TABOR MFG. CO. WITH MACHINE.
CUSTOMER WILL FURNISH PIPE AND HOSE.
8×8
6×8
6×8
6×6
IF 14" SQ. CANNOT BE PURCHASED, BUILD UP SECTION AS SHOWN, OR USE CONCRETE.

FOR SMALL MOLDS AND MEDIUM SIZED CORES



3" Tabor Jarring Machine set in Core Bench.

Write for Bulletin M-J-P.

THE TABOR MANUFACTURING CO.

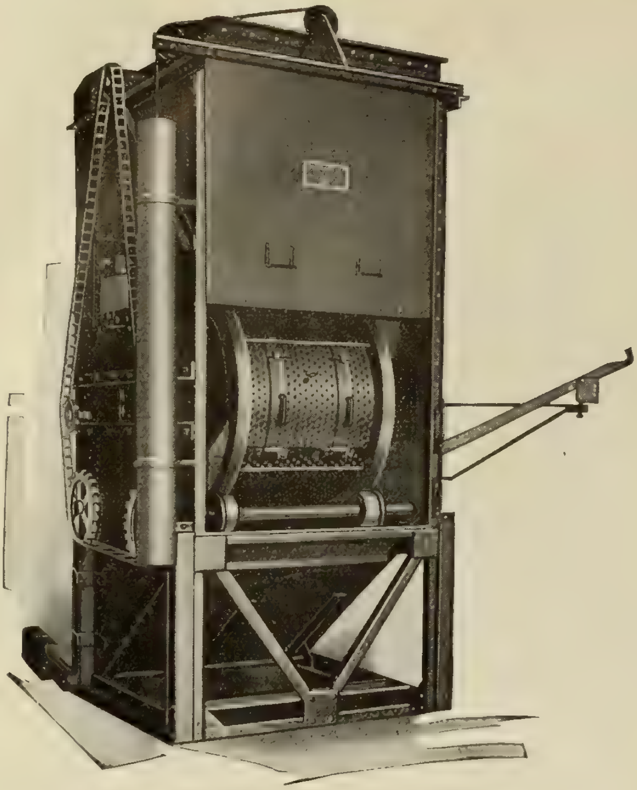
PHILADELPHIA
PA.

FOREIGN AGENTS:

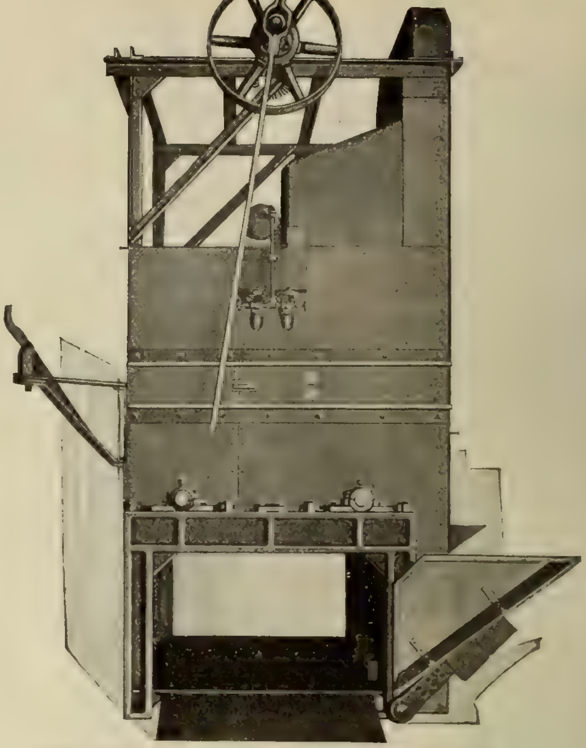
Geo. W. Goodchild & Macnab, 56 Eagle Street, Southampton Row, London, W. C.; Fenwick, Freres & Co., 8 Rue De Rocroy, Paris, France.

FOREIGN AGENTS:

Mitsui & Co., Ltd., New York, Tokio, Japan; Benson Bros., Sidney and Melbourne, Australia.



Front View With Sliding Door Raised

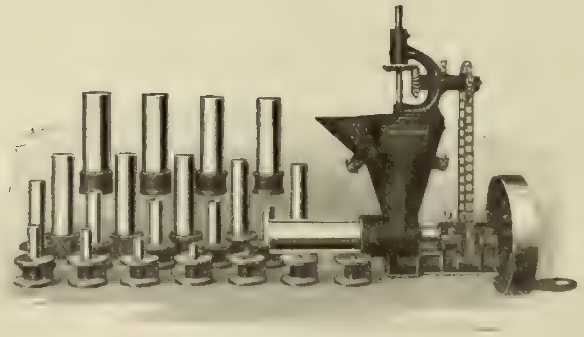


Side View. Truck is Run Underneath Barrel

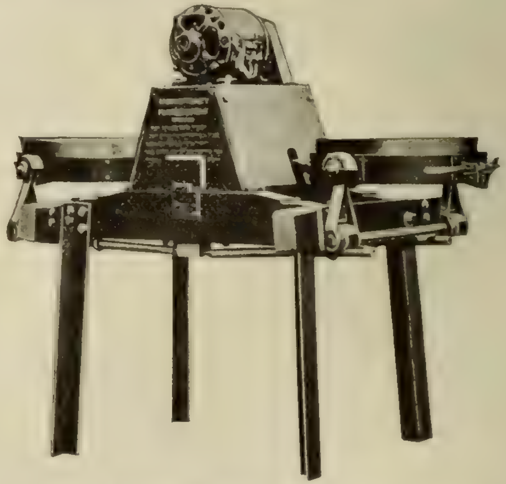
No. 3 Revolving Barrel Sandblast Machine

showing front and side views. Truck is run directly underneath the barrel and load is automatically dumped when the barrel revolves.

We will gladly refer you to malleable steel and iron manufacturers who are operating one or more of these barrels. Many of them have competing makes and can give comparative results. Learn from the operators what results they are getting.



Style A Hammer Core Machine
Other styles to make up to 7" round cores



Electric Duplex Shaker
The fastest, most substantial shaker built

Send for Catalogues

Brown Specialty Machinery Company

2424 West 22nd Street, Chicago

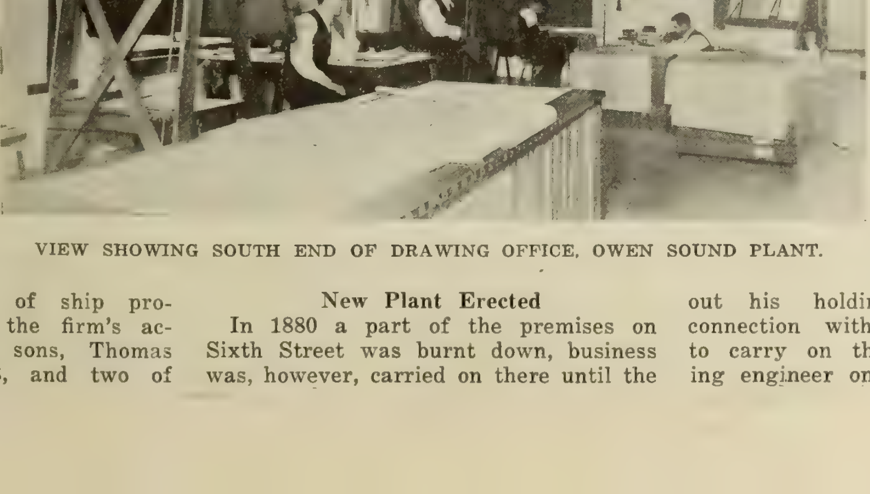
WM KENNEDY & SONS LIMITED.

OWEN SOUND, ONTARIO.

PLANTS AND PRODUCTS.

This firm is a good example of continuity of ownership, its duration dating from the establishment of the enterprise some sixty years ago. In the interval, the size of the original plant and the scope and variety of its activities have shown steady development and expansion. As might be expected, effort in these war years has been concentrated to a large extent on munitions production and that of ship deck and other marine equipment.

THE business of William Kennedy & Sons, Ltd., Owen Sound, Ont., was founded by the late William Kennedy in 1857. He was born near Glasgow, Scotland, and came to Canada in 1831, settling first at Prescott, Ont., and later moving to Athens, Ont., where he established himself in business as a millwright. Mr. Kennedy at that time was a lieutenant in the Militia and participated in the Battle of Windmill Point in 1837. He settled in Owen Sound in 1856 and started a foundry and millwright business in 1857. This was the foundation of the present enterprise. In 1860 the plant was established on Sixth Street and was known as William Kennedy & Sons. Two of the founder's eight sons, Thomas and Matthew, at this date joined him in the firm, which then carried on foundry and machine shop work, together with wood planing and the manufacture of sash and doors.



VIEW SHOWING SOUTH END OF DRAWING OFFICE, OWEN SOUND PLANT.

In 1868 the firm sold out their woodworking and specialized in the manufacture of turbine water wheels, heavy shafting gears, pulleys, bearings, etc., required in the driving of mills, power, and pumping plants. In 1873 the manufacture of ship propellers was added to the firm's activities. One of the sons, Thomas Kennedy, died in 1873, and two of his brothers, John (now Sir John Kennedy), and William, Jr., joined the firm in 1879. The founder, William Kennedy, Sr., died in 1885 at the age of 77 years. From that date until 1896, the business was conducted by Matthew as head and Alexander and William Kennedy, Jr. Sir John was only with the firm two years, 1868 to 1870, leaving to become chief engineer of the Great Western Railway, later absorbed by the Grand Trunk. Sir John was some thirty-five years engaged as chief engineer of Montreal Harbor and though blind is still retained as their consulting engineer. He enjoys an international reputation in harbor engineering.

New Plant Erected

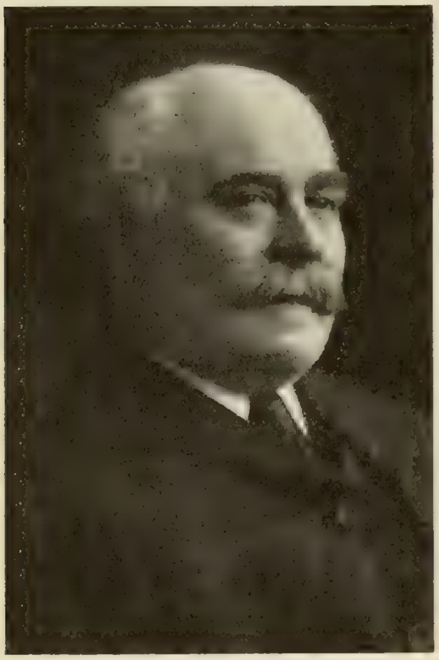
In 1880 a part of the premises on Sixth Street was burnt down, business was, however, carried on there until the end of 1884. During the summer of the latter year new shops were constructed on the present site on the harbor front, these consisting of grey iron foundry, machine shop and pattern shop. Operations were commenced in the new plant in January, 1885. In 1887 the Kennedys built for the town of Morrisburg their first water works pumps of any note. These were rapidly followed by similar and larger installations at Welland, Niagara Falls, etc. These pumps with their water wheels and gearing are still in daily service and giving good satisfaction in spite of their age. Alexander Kennedy, who was superintending personally the installation of the Niagara Falls plant, had his arm sheared off between the pump main spur gear and its connecting rod. The accident affected his general health, and after disposing of his stock to the other members of the firm, he died in 1903 very suddenly while at work.

In the meantime, William Kennedy, Jr., was sent to Montreal to open up and conduct an hydraulic engineering office for the company. Some years later he sold out his holdings and severed his connection with the concern in order to carry on the business of consulting engineer on his own account. He has been for years one of Canada's leading hydraulic engineers and acted as consulting engineer for such plants as the Ontario Power Co., Niagara Falls; the Cataract Power Co., De Cew Falls near St. Catharines; City of Winnipeg; Calgary Power Co.; etc. The name Kennedy has long been well known throughout Canada in connection with the design, manufacture and installation of water power plant machinery.

In 1905 the president's youngest son, T. Dowsley Kennedy, was sent to Switzerland for six months and later to Germany to take a four year University course in hydro-mechanical engineering. He graduated and returned in 1909, and a year later joined the firm.

The present officers and directors are: Matthew Kennedy, president and general manager; D. John Kennedy, 1st vice-president, and manager open hearth steel plant at Collingwood, Ont.; Matthew Kennedy, Jr., 2nd vice-president and manager Bessemer steel plant, Owen Sound, Ont.; D. E. Armstrong, sec.-treas.; T. Dowsley Kennedy, director and manager iron foundries and machine shops.

OLD FRAME BUILDING WHERE THE KENNEDYS STARTED BUSINESS IN 1858.


MATTHEW KENNEDY,
President and General Manager.

In January, 1916, the iron foundry and machine shop capacities were greatly increased. A year later the iron foundry was entirely remodelled and again extended to take care of the demand for exceptionally large, solid, ship propellers required in connection with Canada's shipbuilding programme.

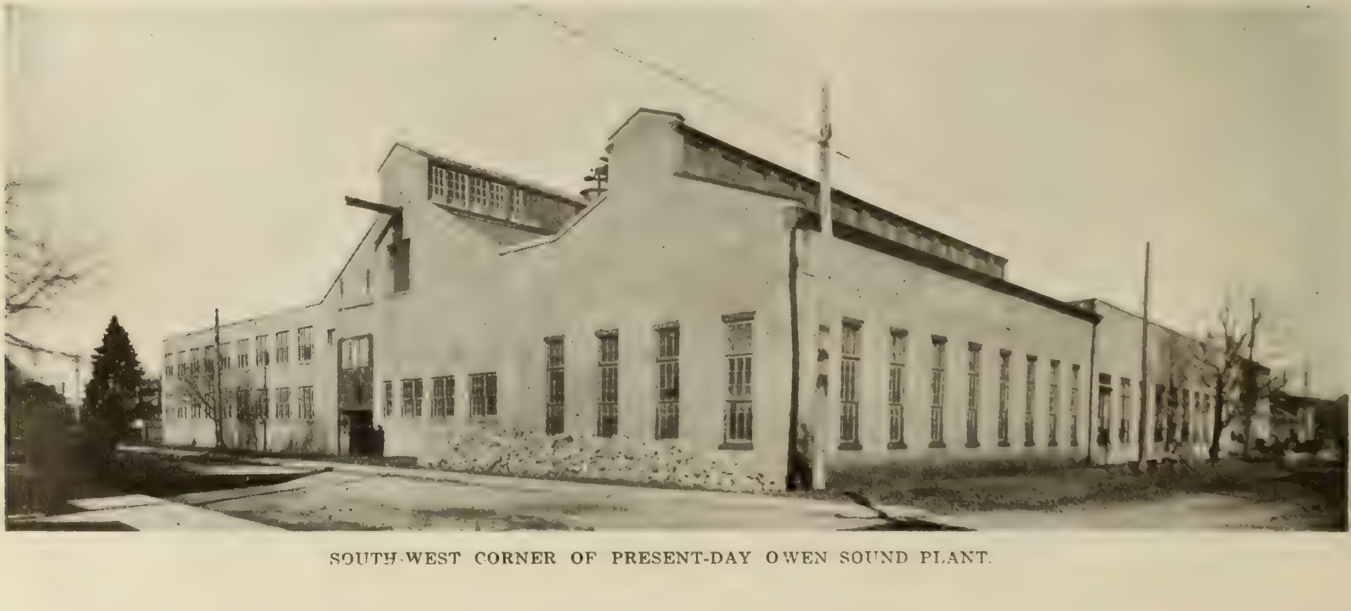
The most important development, however, took place in 1916 when the Kennedys took over the defunct Northern Iron & Steel Co. open hearth steel plant and rolling mills at Collingwood, to produce shell steel, about which more appears further on. In 1917 they installed at this plant their first electric furnace, principally for the manufacture of pig iron. With these new acquisitions, the company has two steel plants, the first one having been established at Owen Sound in 1899.

Extent of Business

The Wm. Kennedy & Sons control and operate three distinct plants, the two at Owen Sound working in conjunction on the general business of the concern while the steel plant at Collingwood is working at present exclusively on the production of steel for shells. After the war when the Collingwood plant is turned over to the production of steel for commercial purposes, it will be an extremely useful adjunct to the company's general business. The Collingwood plant comprises two open hearth furnaces, giving a total capacity of sixty to seventy-five tons of steel per day. The electric furnace can also be used to produce steel. At Owen Sound, steel is produced by the Bessemer process, giving altogether considerable latitude in the type of steel produced.

Owen Sound Plant

The head office and plant at Owen Sound will be described first, being the mainstay of the entire business. It is self-contained, the plant being arranged and equipped so that production of practically all the company's lines can be done there. The plant comprises the office building, pattern shop, machine shop, grey iron foundry, steel foundry, cleaning rooms, pattern storages, etc.

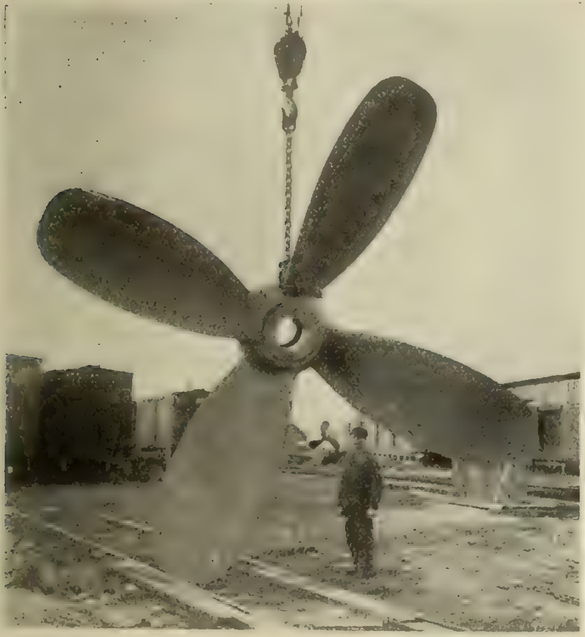

SOUTH-WEST CORNER OF PRESENT-DAY OWEN SOUND PLANT.

EAST END OF MOULDING FLOOR, OWEN SOUND PLANT.

There is also ample yard space for storing raw materials, molding flasks, etc. The office building is 30 ft. x 50 ft. and contains the general, private, and drawing offices, the latter being upstairs.

The building is of solid brick construction and was erected in 1905. The drawing office is equipped with vertical adjustable drawing boards and the vertical system of filing drawings is used together with suitable card indexes. An overhead bridge proves to be a considerable time saver in the usual traffic between draughting room and pattern shop. The pattern shop is located over a part of the machine shop, and is well suited for handling a variety of work, being equipped to turn out patterns for heavy machinery, more particularly large propellers, heavy gears, and water turbines.

The machine shop is 140 feet long by 40 feet wide, and is suitably equipped with a variety of machinery for handling the extensive line of product manufactured by the firm. In addition to the ordinary tools usually found in a machine shop, there is a large boring mill and two specially fitted drills particularly required for propeller and turbine work; also a Gleason gear planer for machining gears of very large pitch.



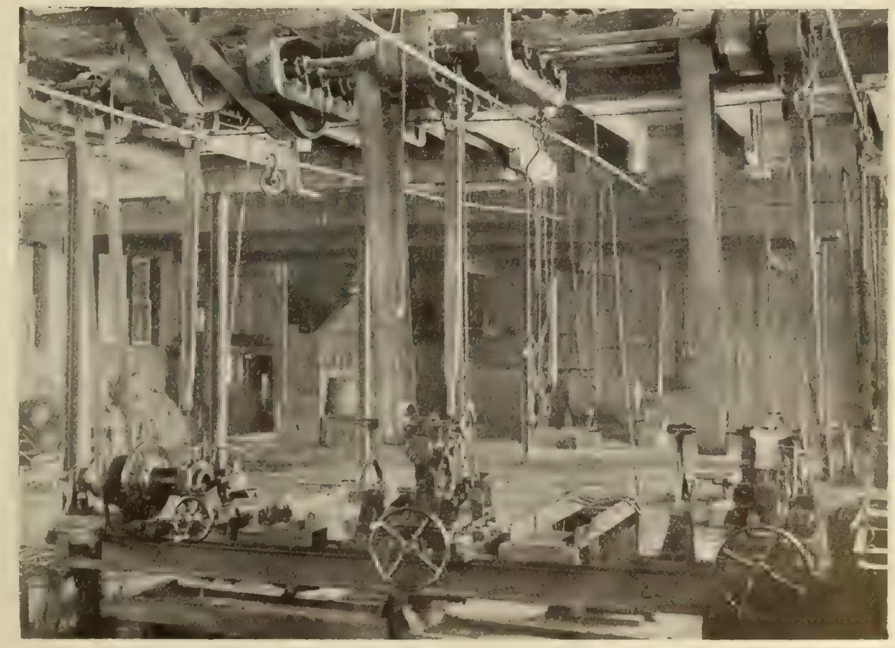
SOLID PROPELLER FOR OCEAN-GOING FREIGHTER WEIGHING 10 TONS AND 17 FT. IN DIAMETER.

The grey iron foundries, 100 ft. long by 45 ft. wide and 60 ft. by 45 ft. wide, are capable of producing a wide variety of work, both large and small. As an instance of this, reference may be made to the one piece propeller shown in process of moulding in one of the accompanying illustrations. This is one of a recent order of four 17 ft. diameter wheels weighing 9 tons. To further facilitate the handling of this propeller foundry work, there has recently been installed another up-to-date electric overhead travelling crane of 15 tons capacity and Northern make.

A heavy jolt machine with a table 4 ft. x 5 ft. and operated by compressed air is a big time saver, ramming up moulds for such work as base plates and frames for anchor windlasses and cargo winches, as well as ingot moulds, etc. A 2-ton compressed air steel jib crane having a radius of 27 feet is used exclusively to serve this "jolter." Pneumatic floor hand sand rammers are used on most large work, and air chippers for removing fins and lumps when cleaning castings.

The steel foundry is an important factor in the company's business, and has recently been enlarged to take care of the increased demand for steel castings. The main building of the steel foundry is 182 feet long x 82 ft. wide; part of it is utilized as a cutting-off room. The steel made here is by the Bessemer process in a two-ton capacity converter, the blast being supplied by a Roots blower driven direct by a steam engine. The mixture for the converter is melted in a Sheldon cupola, the blast being supplied by a Sheldon motor-driven fan. The materials are hoisted to the charging floor by means of a 3 ton Sprague electric hoist. The molten metal is transferred from the cupola to the converter in a truck ladle.

The quantity and quality of materials used in the converter are carefully checked by analysis and are controlled by their own laboratory tests, the company maintaining a metallurgist for this purpose. One advantage in having the Bessemer process is that the cupola can be used for either steel or iron foundry work as required. This cupola is, of course, additional to their regular iron foundry melting equipment. Close laboratory control is also effected in the use of materials and alloys so that different grades of steel and iron castings can be produced as required. There are two 5-ton Northern overhead electric travelling cranes in the steel foundry which can operate in the iron foundry when necessary in case of breakdown or

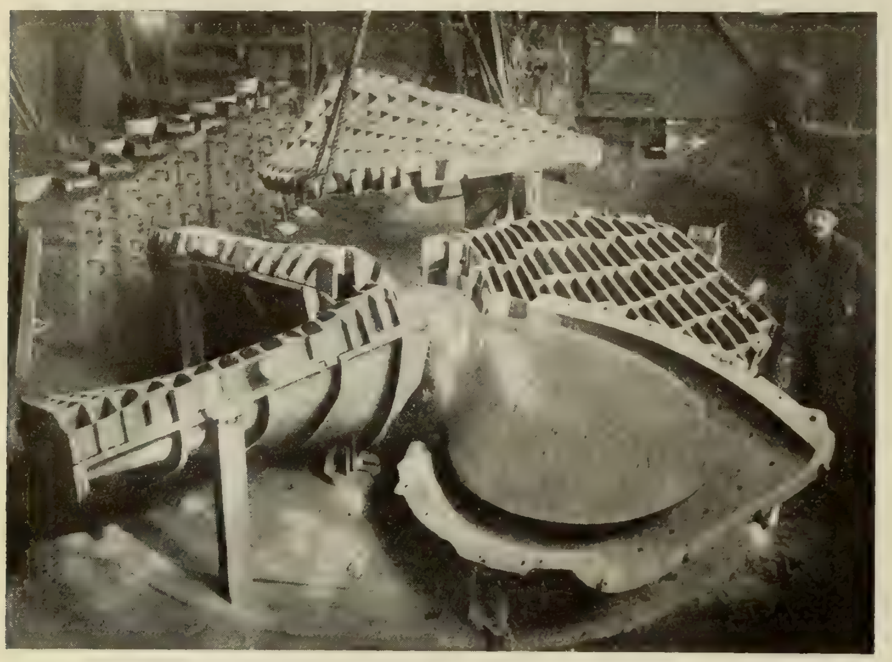


STEEL FOUNDRY CLEANING ROOM, OWEN SOUND PLANT for helping out on extra heavy lifts.

Adjoining the steel foundry is the sand mixing room in connection with which is a sand handling plant of considerable merit. The new silica sand and clay are elevated by a vertical bucket conveyor into large overhead storage tanks. From the tanks the materials drop through chutes and are accurately measured before being mixed in the 6 foot motor-driven rotary mixer and grinder. From there the sand is carried in dump buckets to the various sections of the moulding floor by means of a monorail system. All moulds are carried by the travelling cranes from the moulding floor to large drying ovens where they are dried. The moulds then pass out at the opposite end of the ovens and are distributed on the casting floor by the same cranes; the ovens being located between the moulding and casting floors give a proper routing of work through the shop. The moulders, therefore, do nothing else than actual moulding work.

The cleaning room 50 ft. x 100 ft., with storage in second storey, is equipped with motor-driven tumblers, a sand blast, pneumatic chipping tools, etc. Patterns are stored in large fire-proof rooms conveniently adjoining moulding floors. The storage is divided into sections and indexed for convenient reference. Adjoining the pattern storage is the electrician's department where are also the switchboard appliances for distributing power from the Hydro System. There is located in the pattern storage a heating and ventilating system for the foundry. This plant was supplied by Sheldons Ltd. of Galt. A similar plant is installed in the iron foundry.

A steam power plant is situated alongside the steel foundry, in which are installed a return tubular boiler for heating purposes, the steam engine driving the converter blower, a motor-driven Ingersoll-Rand 300 cubic feet twin cylinder air compressor for suppling compressed air for various purposes throughout the plant. In the cutting off room of the steel foundry, there is installed among other equipment an oxy-acetylene welding and cutting outfit. The flask storage for the steel foundry is served by a network system of overhead monorails, while the flask storage for the iron foundry is handled by a 75 ft. power derrick with a 60 ft. boom.



MOLDING LARGE SOLID PROPELLER—TOP SECTION OF MOLDING BOX REMOVED TO SHOW PATTERN. OWEN SOUND PLANT.

Products Classified

The firm have continuously developed the scope of their business, particularly during recent years, until now it includes:—

Auxiliary ship machinery including propellers.

Water power plant machinery.

Heavy transmission machinery, cut gears, etc.

Steel and iron castings.

Kennedy cutting-off machines for trimming shell forgings and cutting heads off steel ingots.

Shell steel and pig iron.

Auxiliary Ship Machinery

This section may be sub-divided to include the following:—Anchor windlasses, chain stoppers, steering engines, cargo winches, ash hoist, propellers, etc.

Propellers are made in steel, iron or bronze, sectional or solid. Following up their policy of expansion in the auxiliary ship machinery end of the business resulting from the submarine menace, the Kennedys have secured the sole Canadian manufacturing rights for the equipment made by the well known Hyde Windless Co., Bath, Maine. This concern, like the Kennedys, has had the benefit of over fifty years' experience in this class of work and had done over half of U.S.A. Government naval and

INTERIOR VIEW OF STEEL FOUNDRY SHOWING BESSEMER CONVERTER AT LEFT. OWEN SOUND PLANT.

merchant marine work up to the time of the war.

The Kennedy anchor windlasses as now constructed are, therefore, the result of many years' experience of two old concerns and embrace details of construction which have made these units well suited to the work they have to perform. Some of the principal features claimed for the Hyde-Kennedy windlasses are accessibility to all parts for repair; their widest part is aft, thus following approximately the shape of the boat so as to allow as uniformly a clear deck space around the machine as possible. All gearing and shafting are also aft, so as to be well clear of the action of anchor chains. The warping drums run at a high speed for quick handling of hawsers or other ropes. The "Wild Cats" or chain sprockets are also easily thrown in or out of gear when full strain is on the anchor chains and friction brakes.

Probably the best known steering engines manufactured are those of the quadrant, drums, steam-tiller and battleship screw types. The cargo winch is made with either vertical or horizontal engines, the latter being more popular on the Pacific Coast although seldom used on the Atlantic.

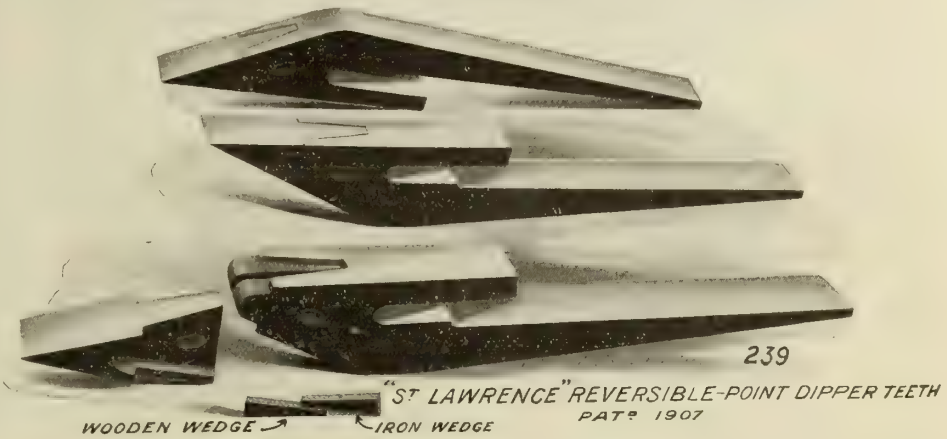
Propellers

Kennedy propeller wheels are the result of long, untiring and successful effort. Methods of manufacture have been developed by which castings are true to pattern, uniform in weight, and smooth in finish. The view of a propeller being moulded shows specially developed equipment for doing this class of work. The illustration shows one blade with the top half of moulding flask removed, the other blades being covered. The rigid cast iron moulding flasks prevent any straining or warping of the mould.

At Owen Sound there have recently been completed a number of what are probably the largest sized solid propellers yet made in Canada. These wheels were made for Canadian Vickers, Ltd., of Montreal for ocean-going cargo steamers and are 17 ft. in diameter. An interesting steel propeller hub recently made for the S.S. Hamonic of the Canada Steamship Lines is also illustrated.

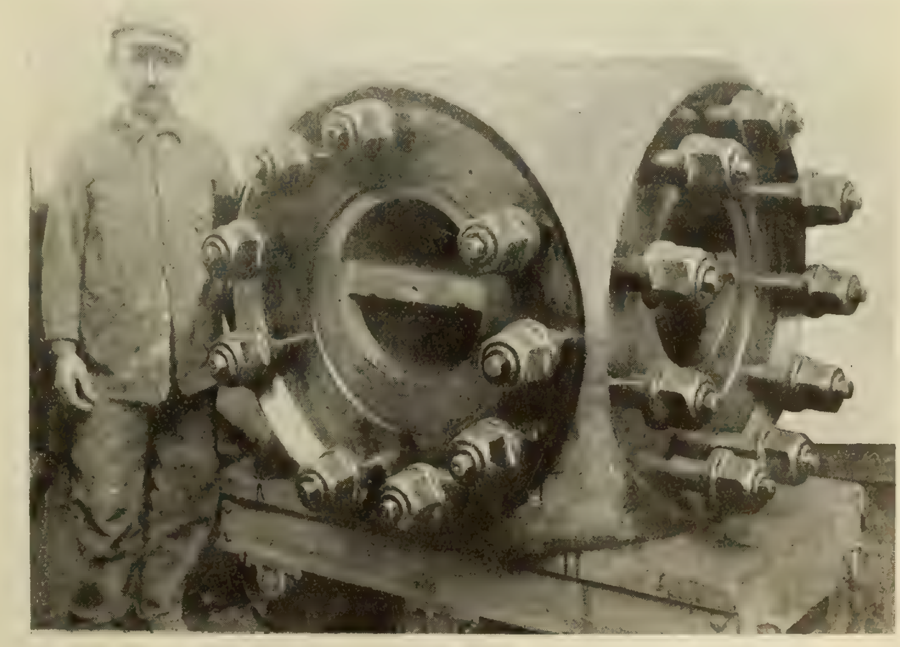
Water Power Plant Machinery

In the year 1868 when the Kennedys first began to make water wheels, the hydro-electric method of generating power was in its infancy in Canada and the plants in operation consisted as a rule of comparatively small units. In later years, the water powers in the country, which are a tremendous asset, have been turned to good account and are now in many districts the principal source of power. This is true of a large number of private plants as well as Government and municipal installations. At the Owen Sound plant there have been produced the units for numerous installations throughout Canada. This branch of the business has made its greatest development in the last decade, in which time the design of the turbine has been considerably improved.



The bulk of the Kennedy made turbines are of the Francis reaction-type which was developed to a high degree of perfection in Europe. These turbines have horizontal or vertical shafts and are suitable for medium and low pressures. As a rule the heads under which they work are sufficient to enable the modern turbine to give a speed high enough to allow direct coupling to a generator. The specific speed of Francis wheels, by which is meant the r.p.m. which a single runner turbine would have if operating under meter head and developing metric horse-power, may be varied by suitable design between 150 and 400 practically without reducing the efficiency. The wide speed variations possible with the Francis turbine is the principal reason for its popularity for reaction work. The best European makers have developed several standard series of Francis runners to secure a wide range of speed corresponding to specific speeds of 150, 200, 275, 350 and 400, the first two being generally used for medium pressure turbines; the other three, especially the last two, for low pressure turbines. Medium pressure turbines are in successful operation for heads up to 350 feet.

Following are a few instances of important water turbine installations carried out by the firm. A large water turbine was built for the Wahnapitae Power Co., of Sudbury, Ont. This unit is a twin horizontal central discharge turbine with end intake, and is rated at 2,500 h.p. Several units of water turbines each having a capacity of 4,500 h.p. have been built and installed in the Ottawa and Hull Power Mfg. Co. plant at Chaudiere Falls. A feature of these units is the internal heating system in the gates of the turbines to prevent clogging by frazil ice. Other plants since installed in the same district have been similarly equipped as a result of satisfactory performance. Five turbines have been installed at Campbellford, Ont., for the Seymour Power Co., these units being twin vertical type with central discharge. The oil step is of special construction supporting not only the entire weight of the turbine rotating parts but also the generator rotor, which is direct-connected to the turbine.



STEEL PROPELLER HUB FOR UPPER LAKES PASSENGER AND FREIGHT STEAMER "HAMONIC."

CHARGING FLOOR 17-TON ACID OPEN HEARTH FURNACE.

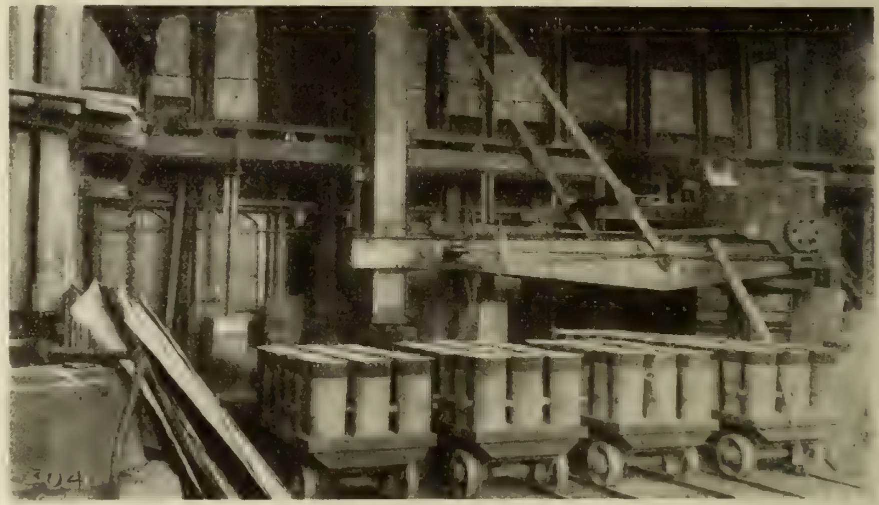
Stop Log Hoists

Another specialty to be included in the water power equipment class is the stop log winch or hoist. The firm are pioneers in the manufacture of winches or hoisting machines for lowering, raising, and piling of stop logs used in sluice dams. These dams have given great satisfaction and are favorably looked upon by engineers owing to the large quantity of water which can be put through them during times of high water and they have also the advantage that during times of low water the head can be kept up to the maximum, thus greatly increasing the efficiency of a water power installation.

The stop-log hoists or winches are of very rigid and heavy construction, so as to ensure safe and quick handling of the logs when operating against full flow and pressure of water. A 27-ton capacity installation at the Calgary Power Co. plant at Kamanaskis in the Rockies, is operated by electricity even to the piling of the stop logs on the deck of the dam where they remain during high water. Handpower stop log hoists are also manufacture. Standard machines are built in three sizes—35, 27, and 17 ton rated capacities.

Transmission Gears

Heavy gears are a prominent specialty of the firm. They regularly make large machine cut gears both bevel and spur up to 100 inch pitch diameter, and 20 inch face. A number of heavy gears were recently supplied the Goodyear Tire & Rubber Company, New Toronto.



TAPPING OUT 17-TON HEAT OF STEEL.

Steel Castings

This branch of the business covers the whole wide field so fully that it is unnecessary to particularize here.

Reversible Dipper Tooth

The reversible point dipper tooth for dredges and steam shovels was designed and patented by Sir John Kennedy and is made at Owen Sound to meet the requirements of hard service in dredging. The interesting feature of this tooth is that the wearing point is reversible. In other words when one side wears down the points may be reversed and so on until it is entirely worn out. The reversing operation takes only a few minutes and no special tools are required in its performance. When the point wears out, it is just as quickly replaced by a new one. They have proved satisfactory even in digging rock.

Collingwood Steel Plant

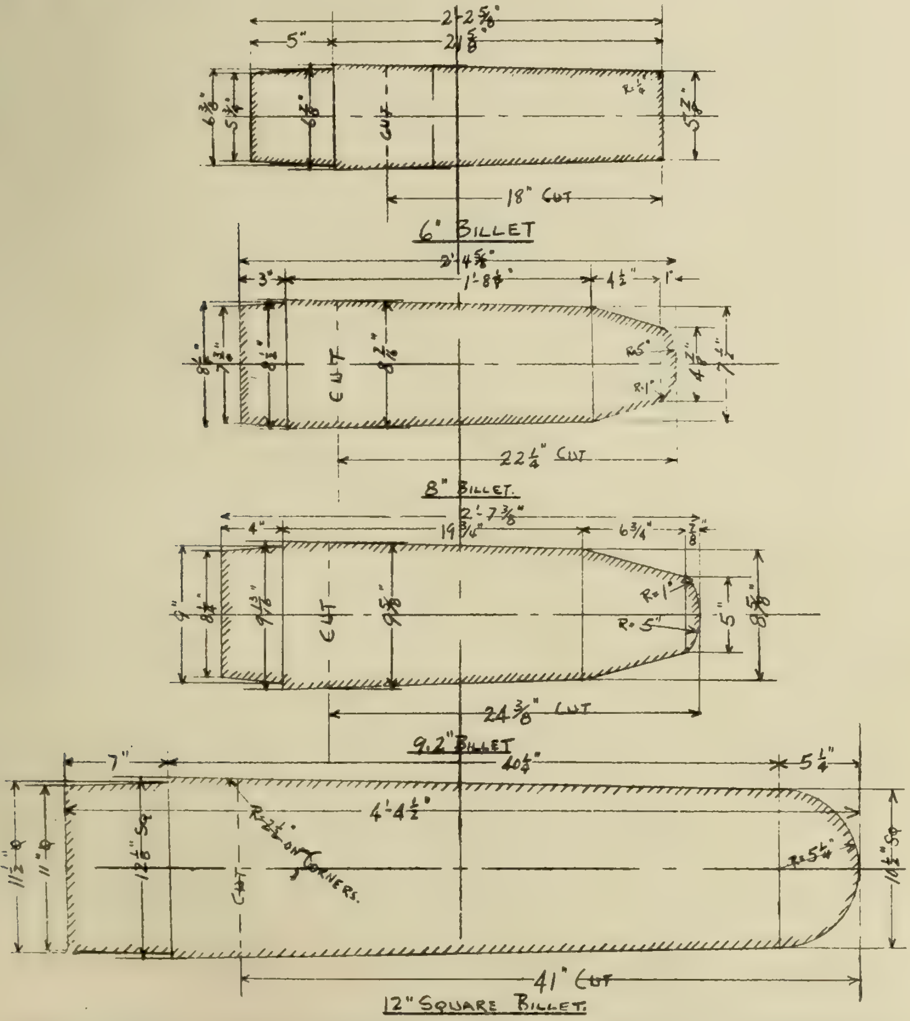
Early in the fall of 1915, after the completion of the 4.5 inch shell steel contract at Owen Sound it was found that no further contract could be received. This was due to the limited tonnage of steel that could be produced by the Tropenas converter, and the exceptionally high cost of the output on account of the greater quantity of low phosphorus pig iron used in this process than in the open hearth. It was therefore felt that some other means should be adopted so that the experience gained by the firm in the manufacture of high grade steel would not be lost to the country in time of war. With this in mind it was decided to look around for some suitable place in which to locate to produce munition steel. After examining several plants it was agreed to repair and commence operating the plant of the old Cramp Steel Co., the latter owned by the Northern Iron & Steel Co., Collingwood, Ont. This plant had been idle for fifteen years and the machinery and buildings were in a very bad state of repair. It was found

STRIPPING 9.2 IN. H. E. SHELL BLANKS

that the two fifteen-ton basic open-hearth furnaces would have to be torn down and rebuilt as acid furnaces. Besides repairing and entirely remodelling the property, it was necessary to instal new machinery and two railroad sidings to take care of the ingots produced. This work was commenced in January, 1916, and it was not until July of the same year that the first heat was taken off.

Since that date there have been manufactured three sizes of steel ingots—the 8-in. shell blank weighing 390 lbs. when cast, and 283 lbs. when shipped; the 9-2 in. shell blank weighing 500 lbs. cast and 390 lbs. shipped and the 12-in. x 10¼-in. square steel ingot for rolling, which weighs 1,500 lbs. cast and 1,350 lbs. shipped. The plant is now casting 6-in shell blanks at the rate of 1,000 per day. The rolling mill is capable of rolling rods and bars up to 3½ finished diameter, but has not been operated as yet by the Kennedys, although they would entertain a reasonable proposition from any reliable experienced rolling mill men to do so. The dimensions of these different sizes are shown on sketches marked A, B, C, and D, respectively.

2,500 H.P. WATER TURBINE OF TWIN HORIZONTAL CENTRAL DISCHARGE TYPE WITH END INTAKE, BUILT AT OWEN SOUND PLANT.



STEEL BILLETS FOR VARIOUS SIZE AND TYPE SHELL PRODUCED AT COLLINGWOOD PLANT.

The operations cover a twenty-four hour day. The charging floor and casting floor labor involves three shifts of 8 hours each. The cutting off and electric furnace departments are two shifts of twelve hours each. The four hundred employees turn out two thousand shipping tons monthly.

During the spring of 1917, the low phosphorus pig iron situation became very acute. The production was less than the demand, and the prices advanced very rapidly. Arrangements were made for a supply of electric power to operate an electric pig iron furnace. This furnace reduces turnings, etc., into low phosphorus pig iron with the addition of carbon and ferro silicon. It produces from 12 to 15 tons daily, according to the amount of power received. About 1,000 h.p. is required.

* * *

COAL AND STEEL IN NOVA SCOTIA DURING 1917

By F. W. Gray, M.I. Min. E.*

IN an article reviewing the coal industry for 1916 which appeared in CANADIAN FOUNDRYMAN a year ago, the writer forecast that the coal output for 1917 would decline to a figure between 5½ and 5¾ million tons. From present indications it appears that the production of 1918 will show a still further decline to between 5¼ and 5½ million tons. The capacity of the Nova Scotia coal mines for output is 7½ million tons per year, so that the present rate of production is not less than two million tons per year below the possible tonnage were sufficient labor available.

The coal production of Nova Scotia in long tons during the war period compares with the year preceding the war as follows:

1913	7,263,485
1914	6,650,038
1915	6,708,695
1916	6,190.000
1917 ....(about)	5,735,000

The cumulative shortage for the war period to the end of 1917, computed on the 1913 basis, is about six million tons. At a value of $4.00 per ton, this shortage represents a sum of say $25,000,000 that has been expended in the United States for a raw material which could and should have been produced in Canada. A sum of this magnitude is not a negligible factor in the matters of trade balance and the rate of exchange, apart altogether from the throttling of industry that is caused by coal shortage.

The most notable decline in production is in the case of the Dominion Coal Co., its output having dropped from 4,091,790 tons in 1916 to 3,575,000 tons in 1917, if the Glace Bay collieries only are included. The output of the Springhill Collieries remained about the same as in

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*Dominion Steel Corporation, Sydney, N.S.

1916. A noteworthy feature of the year is the aggregate tonnage of the smaller operators, situated principally on the fringes of the Pictou field and in the neighborhood of Maccan and Athol. This amounts to no less than 100,000 tons. Unfortunately, however, this increase in smaller operations does not begin to counterbalance the reduction in the outputs of the larger companies, nor is it a factor of permanence. The exploitation of abandoned areas and crop workings is an ephemeral condition caused by the prevailing coal shortage and the high price obtainable for coal in local markets. These small operators will in large measure disappear when the coal markets again become normal.

No Excess Supply Imminent

It must be admitted, however, that there is no immediate prospect of any excess of supply over demand in the coal market. So far as Nova Scotia is concerned, the shortage of labor has forced a cessation of all new development at the coal mines, and whenever a sufficient labor supply becomes available it will be found that the existing coal mines will have been so depleted that several years must elapse before the lost ground can be regained.

The decline in the coal outputs has indeed reached a stage where it threatens to restrict the production of steel. The product of the coal seams is not uniformly suitable for metallurgical purposes, and in several instances the supply of metallurgical coal is not at all reassuring for future expansion of steel manufacture.

Numerous Wage Increases

The year 1916 was marked by a succession of wage increases at the collieries, these being granted in quicker rotation and more substantial in amount than in any comparable period in the history of coal mining in the province, but 1917 in this respect has equalled the record of 1916. In May of this year the Provincial Workmen's Association made a demand upon the coal operators of the Sydney district for an increase in wages of 25 per cent. The matter was complicated by the attitude of the rival Miners Union, the U. M. W. of Nova Scotia. Applications were made for a conciliation board by several parties, but eventually a Royal Commission was appointed which devoted its chief attention to a reconciliation of the rival unions.

On the recommendation of the commission an increase in wages was granted to workmen at the collieries of 12½ per cent. plus an increase of 10 cents per day to workmen earning less than $2.50 per day. A provisional union of the two labor organizations was brought about. This was consummated later in the year, resulting in the formation of the Amalgamated Mine Workers of Nova Scotia, which body took over the existing wage agreement between the P. W. A. and the operators, more particularly the arrangement between the P. W. A., and the Dominion Coal Co.

Demand for Further Wage Increase

The A. M. W. of Nova Scotia has served the operators in the Sydney district with notice of the termination of the existing wage agreement as at the end of the year, and has demanded a wage increase ranging from a minimum of 30 per cent. up to 75 per cent. advance on existing rates. It is absolutely impossible, from the standpoint of the operators, to grant an increase of the magnitude asked, as it would necessitate an increase in the selling price of coal of from $1.50 to $2.00 per ton, and even at this increase in selling price some of the less remunerative collieries would be compelled to cease operations.

In view of the fact that the increases which have been granted in wages have already exceeded the calculated increase in the cost of living, it is felt that there is no real justification for the heavy increase asked by the A. M. W. of Nova Scotia. It is not anticipated that any stoppage of work will result, and the disagreement between the A. M. W., and the operators will probably end in the appointment of a board of conciliation.

The Explosion at New Waterford

The most important single occurrence of the year was the explosion at the No. 12 Colliery of the Dominion Coal Co. at New Waterford which resulted in the death of 65 men. Arising out of this, three prominent mine officials, namely, the superintendent of the Waterford district, and the manager of No. 12 Colliery, both officials of the Dominion Coal Co., and the deputy inspector of mines for the Waterford district, an official of the Provincial Department of Mines, reporting to the Inspector of Mines, have been indicted by a Grand Jury on a charge of manslaughter. The indictment has caused much comment among the mining officials of the province as there is no precedent in the latter for the criminal prosecution of mining officials, except through the intervention and direction of the Inspector of Mines. The indictment of the Deputy Inspector of Mines is regarded as a particularly unprecedented incident.

Dominion Steel Corporation

Large plans for extension of the steel industry in the Sydney district are mooted, but so far the shortage of labor has been a serious deterrent to any undertakings of consequence in this direction, with the exception of the new coke ovens of the Dominion Iron & Steel Co., which are making fair progress towards completion. The brick stacks are erected, the foundation work mostly finished, and the site of the oven structures has been thoroughly built-in for protection from the weather so that the erection of the ovens can proceed uninterruptedly throughout the winter. It is hoped that the first block of ovens will be making coke in the early summer of 1918.

One of the blast furnaces of the Dominion Iron & Steel Co. has been completely re-built on a much larger scale, and will be ready for operation next spring.

As part of the plan which includes the re-building of No. 1 blast furnace and the erection of the new coke-ovens, the Dominion Iron & Steel Co. are also erecting a new coal-washer, and the combination of modern coke-ovens with the latest type of coal-washer is expected, with the new blast furnace, to bring about a great improvement in the yield and quality of steel, accompanied by considerable economies in the practice.

Nova Scotia Steel & Coal C.

There are indications that the policy of the Nova Scotia Steel & Coal Co. will in the future concentrate more upon the manufacture of steel and steel products than upon the mining of coal for sale in the open market. During 1917 the Nova Scotia Steel & Coal Co. did not send any coal to the Montreal market, while the Dominion Coal Co. shipped only 50,000 tons, which compares with 2,000,000 tons in seasons prior to the war period.

The fabrication of steel freighters has proceeded steadily throughout the year at New Glasgow, and it may be confidently expected that further development is to take place in shipbuilding in the province. Indeed the hesitancy and lack of enterprise shown by the province in this matter of steel shipbuilding is in strange contradiction to the usual attitude of Nova Scotians whenever opportunities have offered in the past. There was surely never a time in history when the demand for steel ships was so insistent, and so likely to remain insistent as is the case to-day.

The Canadian Government made a capital mistake when it cancelled the privilege previously granted to Norwegian and other foreign ships to trade in Canadian coastal waters and did not simultaneously offer a system of bounties to encourage shipbuilding in Nova Scotia. The cancellation of the coasting privileges without the necessary corollary of a policy to stimulate shipbuilding in the province seemed incomprehensible at the time, but to-day it stands revealed as a first class omission.

To sum up the prospect for the steel industry in the province seems quite encouraging, but the thing that causes disquietude is the ever declining coal output, and the probability that production of coal is bound to continue declining.

* * *

THE production of boron and ferro-boron of uniform quality requires expert study. Cheap and pure chromium is now obtainable; the electrolysis of its fused salts is difficult on account of their high melting points, but perhaps the electrolysis of aqueous solutions of chromium salts could be so controlled that heavy deposits would be produced. Then, too, chromium electro-plating is for many purposes superior to nickel, but the technique of constantly producing perfect plating has not been accomplished.—Dr. R. F. Bacon.

Modern Economies in Pickling Steel[*]

By J. H. Snyder[**]

Increased costs in labor and materials have been so continuous and widespread that few branches of engineering industry have not been compelled to devote more than ordinary attention to every opportunity for effecting economies. Increased use of machinery and care in the choice and strength of acids to insure uniform and reliable work are advocated.

DURING the last five years, and more especially the last two years, on account of the rapid rise in the cost of labor and acid, practically all the larger plants and many of the smaller ones have made efficient changes in their pickling department to reduce labor and acid consumption, increase output and get a more uniformly pickled product. Experiments have been made with solutions of potash, Wyandotte cleaner, etc., to eliminate oils and grease preparatory to the acid bath, thereby saving a large percentage of acid.

Increased Use of Machinery

Conveying machinery, trucks, cars cranes, etc., have recently been installed to increase output. Wire is now frequently sent from the mills to the cleaning departments on an endless chain conveyor, with hooks spaced at suitable intervals for holding the wire coils. Ordinary factory trucks are often used to transfer sheets, tin plate, forgings, pipe, castings, etc. Sometimes, where conditions are suitable, tracks are laid throughout the plant with switches and turntables and cars convey the material over these tracks to the different departments. In large plants electric cranes are used for carrying material to and from the cleaning department. Devices are attached to the crane hooks for carrying each particular product, thereby effecting an efficient means of transfer.

Electric hoists, air hoists and jib cranes assist the men to place and remove material being cleaned in the vats, and also to shift this material in the acid solution to obtain better results in cleaning. In many cases large electric cranes, used in the transfer of the production from one department to another, are used for this purpose. This method, used in several plants with more or less favor, has the following objections: The acid fumes constantly rise and come in contact with the electrical apparatus, causing increased maintenance cost and delays in operation; the objects lie motionless nearly all the time in the acid solution, which, on account of little or no agitation, is of varying density from bottom to top, so that certain portions of the objects are overpickled and other portions contain unpickled spots.

Types of Pickling Machines

Many companies have installed pickling machines to take the place of electric cranes and reduce the labor. These machines are to a great extent acid proof, simple in design and fool proof in operation. The surging or plunger type, which has been in use a number of years, forces the acid up through the material being pickled by means of a plunger. This keeps the density of the acid throughout the vat constant. The machine is installed where an extremely large tonnage is desired and seems a great improvement over former methods, but since the material is not agitated the greatest economy is not reached.

A machine made by the Mesta Machine Co. agitates the material as well as the acid by moving the load up and down through the different solutions and is being used for almost every kind of product that is being pickled or cleaned. The machine is operated by steam or air from a central plunger carrying horizontal arms from which are suspended acid proof crates. The number of arms is governed by the number of baths required.

Pickling, rinsing and loading are all done simultaneously. Sudden admission of steam or air in the cylinder at the end of the down stroke of the plunger causes a snap which tends to separate and shift the material so as to remove the scale or sand, scour the material and mechanically aid the chemical action of the acid. The advantages of this machine are: Crane service can be eliminated; labor can be materially reduced; acid required per ton pickled can be reduced; it is simple in design and fool-proof in operation; exhaust steam can be used for heating the vats; maintenance cost is low, and small floor space is required.

Acids and Pickling Compounds

To have ideal pickling the scale and oxides should be removed without any chemical action on the metal directly beneath them and great care should be exercised in the choice and strength of acids so a maximum cleaning action may be obtained with a minimum solvent action on the metal.

Acids used for pickling are sulphuric, muriatic or hydrochloric and hydrofluoric. Various compounds are also used. Sulphuric acid 60 deg. and 66 deg. Baume is most generally used in this country. It is generally admitted that sulphuric acid solutions clean metal as well as other acid solutions if made strong enough to remove all scale with sufficient rapidity not to allow any part of the material to become overpickled, or combined carbon to precipitate and form a graphite coat on the surface.

The proper percentage of sulphuric acid necessary is governed by experience and is controlled by the character of the material to be pickled. According to Comey (Dictionary of Chemical Solubilities) the rate of corrosion increases with concentration of acid up to a certain point, after which the rate of corrosion decreases. This variation is sometimes very irregular with different materials. The action of acids also increases by raising the temperature. Most men mixing solutions guess the amount of acid necessary; some test with the hydrometer, others tell by taste the strength of a solution.

Many companies change the sulphuric acid solution every 24 hr. When work is begun in the morning a solution of about 8 per cent. sulphuric acid by volume is put into the vat and the proper amount of water is mixed with the acid. Throughout the day sufficient acid to keep the necessary strength is added. The vat which contains scale and ferrous salts is cleaned out completely and a new solution made for the next 24 hr. This is done where large tonnages are pickled. In most of the plants acid is added for two or three days, or even much longer than this, and from time to time the scale is cleaned out and some of the weakened acid solution drawn off.

Use of Potash

Where the material to be pickled is covered with oil or grease potash solutions are used to clean the surfaces. Potash is very expensive and a substitute known as Wyandotte Cleanser is used. It is claimed that 50 per cent. sulphuric acid is saved by proper cleaning of material preparatory to the acid bath.

Some substitutes used in place of sulphuric acid and in connection with it are Edis Compound, Kleanrite, Nitre Cake, etc. Edis Compound is manufactured in dry cakes which are soluble in water. The temperature of the solution is kept about the same as with acid. Kleanrite is a powdered compound, and is ordinarily used in a solution made up of 1 lb. of Kleanrite to 4 or 5 lb. of water. This solution may be varied to suit the character of the material. Nitre Cake is also used in a similar way. About 1 lb. is used per gal. of water. The substitutes have met with favor in some plants and it is said that they do not emit disagreeable fumes, such as is the case when pickling with sulphuric acid.

The amount of sulphuric acid per ton of steel pickled varies with the character of material and with the chemical analysis of the acid. It ranges from 60 lb. to 200 lb. per ton of steel. Arsenic is very detrimental in sulphuric acid, and if one-tenth of one per cent. is contained in the acid, pickling is hindered to a considerable extent. A great deal more acid is required with 60 deg. than 66 deg.

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[*] A paper read before the American Drop Forge Association.

Baume sulphuric acid and there is a tendency to more arsenic in the former than in the latter. However, some companies are pickling with 60 deg. Baume acid. Considering the low cost of this acid, they claim to pickle as fast and for the same cost per ton as with 66 deg. acid.

Correct Temperatures

The temperature of the sulphuric acid solution should be kept as near the boiling point as possible. In various plants the temperature varies from 75 deg. F. to 212 deg. F. For hand pickling the temperature is generally preferred low on account of the danger of having a hot open acid vat into which workmen may fall. Usually where this method is used ventilation is very poor and laborers cannot work efficiently because of the steam. The temperature of the bath frequently is obtained by connecting a steam pipe to the vats from the low pressure boiler used for heating the office buildings, shop offices, etc. This necessitates long steam lines and the vats usually get what is left when all other requirements are provided for.

The usual practice in plants of ordinary size is to pipe live steam into the acid solution. In this case a great saving can be effected when pickling with a steam-operated machine by piping the exhaust steam through an oil separator into the vats. In some cases, especially in smaller plants, anti-acid coils are used to which steam is admitted, and in this way the solution of acid is not weakened by condensation of steam.

High temperature has a remarkable effect on the efficiency of the chemical action of the acid and it is extremely detrimental to good work, as well as extravagant in acid consumption, to use a lukewarm solution of sulphuric acid. On the other hand, it is claimed that when the bath is kept too hot a large amount of finely divided acid is carried up in the vapor which corrodes the structural steel of the building and, in time, may cause serious trouble.

The temperature of water in the vats is a problem which everyone must work out for himself, being governed entirely by the kind of material to be washed. Certain materials require cold water, while others require it as hot as possible. For instance, enameled ware is immersed in cold water, while sheets in heavy gages are rinsed in very hot water and allowed to dry from the heat thus absorbed. But lighter gage sheets must be put through a drying furnace to prevent rusting.

The following table shows the varying amounts of sulphuric acid by volume and the time necessary for successful pickling, together with the method used as a basis for the figures given:

Kind of Material	% of Acid by Volume	Average Pickling Time in Minutes	Method
Tin plate	2-10	6-10	Machine
Tin plate	10-20	10-20	Hand
Sheets	4-10	8-12	Machine
Sheets	10-18	10-20	Hand
Wire	6-12	15-30	Machine
Wire	10-20	25-50	Hand
Pipe	6- 8	10-15	Machine
Pipe	8-20	20-25	Hand
Cold rolled steel..	8-10	12-15	Machine
Cold rolled steel..	10-15	20-25	Hand
Stampings	8-12	15-18	Machine
Forgings	8-10	15-18	Machine
Forgings	15-20	20-30	Hand
Enameled ware ..	10-15	15-20	Machine
Brass	10-15	5- 8	Hand
Alloy forgings ...	8-10	20-30	Machine
Alloy forgings ...	8-10	30-45	Hand

After the material is properly pickled it is transferred to the water bath, where the acids and ferrous salts are completely washed off.

Vat Construction

Vats used for pickling solutions are made of white pine, cypress, California fir, birch, concrete, anti-acid tile brick and other material.

The most preferable material at present is No. 1 white pine, although it is somewhat expensive and difficult to get. When a vat is properly constructed from this material an average life of from two to four years is obtained. There are companies using concrete vats lead lined, wooden vats lead lined, and anti-acid tile brick with success. However, the cost of a vat made in this way is more than that of the ordinary wooden vat, and it is a question whether the added life justifies the extra cost.

A good construction of a wooden vat is to use 6x6's or 6x8's or 8x8's, painted with thick white lead and rabbeted together with copper bolts put down through the center. A false lining on the walls and the bottom of the inside of the vat is made of 1-in. match white pine. Guards made of 2x4's or 2x6's are placed up and down in the vat at different points to protect the lining. This lining is the only part of the vat that must be removed and repaired.

In the use of concrete tanks it is best to lead line them to keep the acid from being continually in contact with the concrete. Also, concrete chips very easily when struck by the crates while handling the material.

Features of Ventilation

An important factor in the pickling department is proper ventilation of the pickling room. The suggestion usually made is to construct a high building with a ventilator on top containing a double row of windows. This, however, is not the best method. When volumes of vapor rise in winter weather they are met with a strong current of air from the windows above, since cold air rushes into the room instead of allowing the warm vapor to wend its way out.

A well ventilated pickling room, not over 15 ft. high, has a single row of windows on one side of the building, slightly higher than the top of the vats. A small fan placed in the window opposite each acid vat induces a continuous volume of vapor and acid fumes, coming directly from the surface of the acid vat, to pass through it. Thus practically no vapors or fumes are left in the pickling room. The temperature of the room is about 60 deg. Fahr. and it is important to keep it at least this high. It is customary in many plants to provide little heat to the pickling room and in winter workmen are forced to grope about amid clouds of vapor at almost a freezing temperature.

Another excellent method of ventilation is to take in cold air through a series of hot steam pipes and then force it up into a large horizontal pipe which runs along the pickling room about 15 ft. above floor level. In this horizontal pipe are several down comers, through which the hot air passes. The temperature is maintained at from 60 deg. to 70 deg. to prevent the formation of vapor. The fumes are forced up by the warm air and pass out of the building through a single row of windaws at the top. Another system forces air up through pipes placed near the floor level at an agle of about 45 deg. on the opposite side of the room from the vats. By this method, not only is the room heated in winter and cooled in summer, but the rising fumes are caught, taken up by the blast of air and carried out of the ventilator.

When a pickling department must be laid out in a large building containing machinery, a very good method is to build semi-circular brick walls around the vats, which tend to carry the fumes up 20 or 30 ft. A fan placed in a ventilator above will conduct them out with comparatively little damage.

Pickling Versus Sand Blasting

In the drop forge industry, pickling, tumbling and sand blasting are the three principal methods used in the cleaning department. Pickling is preferable if the acids and salts are thoroughly washed from the surfaces of the forgings.

Information received from one of the largest companies in the country shows there is no favorable comparison between pickling and sand blasting. In the former method all surfaces are cleaned thoroughly from oxides or foreign substances which are detrimental to the machining operation, while in the method of tumbling and sand blasting, small forgings, tumbling together, hammer fine sand into their surfaces. The resulting cost of machining is 300 to 400 per cent. more than that of pickled forgings. Furthermore, drop forgings containing small bores or indentations are not cleaned properly by sand blasting. The same authorities claim that all companies in the drop forging business eventually would pickle their product, as the additional cost is more than offset in machining.

In this connection the reclamation of waste acids for the manufacture of copperas is important. In one instance a company allowed waste acid to flow down the river for years and later reclaimed it with a net profit of $60 per day. Comparatively few companies are doing this at present and these only experimentally. Within the next decade this by-product will be generally made throughout the country.

* * *

GRINDING wheels get their cutting efficiency from speed of rotation, and as the selection of proper grades and grits is dependent upon uniform running conditions, the operator, therefore, must not expect a wheel which works right at a speed of 8,000 revs. per min. will work as satisfactorily at either 7,000 or 9,000 revs. per min.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and
News of Foundrymen's and Allied Associations. Contributions Invited.

FILLING UP ODD TIME IN THE FOUNDRY

By T. J.

IN most foundries it occasionally happens there is a slack interval in which it is inadvisable to put off the moulders and other workers, but still there is difficulty in keeping them employed sufficiently to cover expenses. At such periods some form of work, which might be called "stock work," is very desirable, and in regard to this there are many domestic castings that can be turned out at a moderate profit if anyone cares to look around. There is always some demand for iron wheels for toys, such things as false bottoms for grates, door and garden scrapers, and other things readily made with no very high grade metal, and higher up there are ornamental castings both easy to make and selling regularly in the retail trade. To assist in the selection of goods to make, get hold of a few illustrated hardware catalogues, and see what can be produced cheaply, bearing in mind that as nothing was being made to order, the stock would have to be made in slack times to meet the orders as they arose.

Having made what might be thought a good selection, the drawings should be taken to some distributing house and terms arranged with them for the sale; they will probably purchase certain stock quantities at various times, sending out in small lots as their orders came in. At the price charged to retailers for much of the ironwork there is room for good profits to both makers and dealers, thus making the matter well worth consideration. In brass and other metals there are a good many outside items that can be made to fill up odd times and which can be done with scrap metal as a rule, so long as it is run down of one color, and beyond this mere foundry work machined work can be produced where there are facilities for doing this cheaply in slack times; some kinds of toys, and what may be called puzzle locks, not being despicable as a small means of paying wages as well as the cost of material, all however, depending on cost of production. Necessarily, the workmen must assist in filling up the time to the best advantage without slacking; but usually they will take advantage of this kind of work rather than stand idle, that is, if proper explanations are given to them.

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THE SUCCESSFUL TOOL DRESSER

By J. R. M.

THE success of a certain tool dresser, known to the writer, was his knowledge of human nature and a careful study of the men who were continually using the different tools he was called upon to make and temper. He did not follow the general practice of tempering the tools to set standards of color, or degree of hardness, but used his judgment in making the various tools to suit the particular workmen that were called upon to use them. He was of the opinion that a smith should adapt himself to the special needs of the individual operator and guide his tempering of the tool to correspond to the ability of the user. A skilled mechanic, who knows how to grind a tool and use it properly, will use a much finer and higher tempered tool than another man or boy less skilled in these essential requirements. A smith who can adapt himself to such conditions is assured of greater efficiency from his output from the forge.

◆

PATTERN-MAKING NOTES

By J. W. Broadbent.

FOR turning work between centres the spur and cup centres, Figs. 24 and 25, are the best to use. The ordinary 60° centres are sometimes used, but unless large heavy patterns are being turned, and a centre plate is put on each end of the job, these centres are better left on the metal turner's lathe. When used on split patterns, the 60° centre has a tendency to force the joint apart.

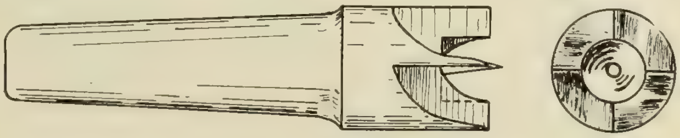


FIG. 24.

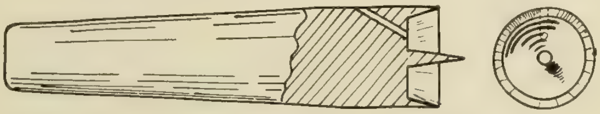


FIG. 25.

Lathe Centres

The spur centre, Fig. 24, is the driving centre. It has a central point and four spurs. By making one spur narrower than the remainder, work which has to be taken out of the lathe can be put back again so that it will run true and occupy its former position.

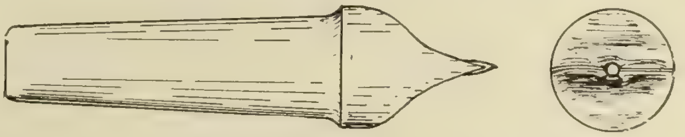


FIG. 26.

The cup centre, Fig. 25, is the dead centre, having a central point surrounded by a wedge-shaped ring with a sharp edge. The cup centre should be provided with an oil hole as shown, and when the centre is put in the lathe this hole should always be at the top.

A very effective method of lubricating the tail centre is to fill the inside of the cup with grease before placing the work between centres; grease being thicker than oil, does not soak into the wood so readily.

The central points may either be turned out of the solid metal or inserted separately into a hole bored in the centre, the latter method being preferable, for when the points become worn or battered they are easily renewed. The only reason for these centre points is to locate the centre of the piece to be turned; they do not in any way support or drive the work, being too light for this purpose.

Keep Centres Sharp

When turning patterns in halves it is necessary that the exact centre be located, and this cannot be done with a blunt centre. A sufficient angle is 20°, and the point should project beyond the end of the spurs and in the cup centre beyond the ring.

The ring of the cup centre should be bevelled on the inside, as shown in Fig. 25, not on the outside, as is often found to be the case. It can easily be seen that when work is being turned in halves the inside bevel will have a tendency to clamp the pieces tighter together. When the bevel is on the outside of the ring the tendency is to force the two halves apart.

Fig. 26 shows a driving centre, having a centre point and two wings, one wing being curved, so that work may be replaced in the lathe to occupy its former position.

This centre is useful for turning solid work, but for split patterns the spur centre, Fig. 24, is to be preferred.

Patterns in Halves

When turning patterns in halves, the two halves must be secured firmly so that there is no danger of their coming apart in the lathe.

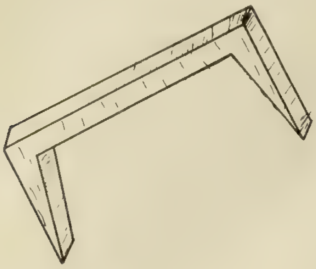


FIG. 27.

It is often necessary during the process of turning to take the pattern apart, and in such cases the best method is to leave the stock longer at each end and secure the two halves with wood screws placed in this waste wood. Long slender work will require screws to be placed at intermediate points between the two ends; they should be well countersunk below the surface, so that the turning tools will not strike them.

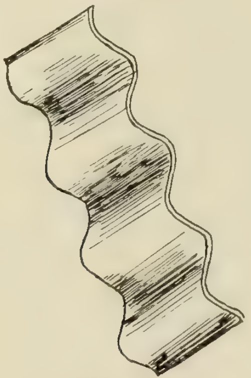


FIG. 28.

Another method is to leave the stock longer than required for the pattern and glue the ends for a distance of about ½ in., allowing the glue to set hard before turning.

The glue will form a hard joint at each end, and great care must be taken when centreing the work so that the centre will not run into the softer wood.

Centreing the Work

A fine centre punch is the best tool to use for centreing work. Pounding the lathe centres into the ends of a job is destructive as far as the lathe centres are concerned, and unnecessary as a means of forcing the spurs of the centre into the wood. Advancing the tail screw when the work is placed between the centre points gives sufficient pressure to force the spurs into the wood.

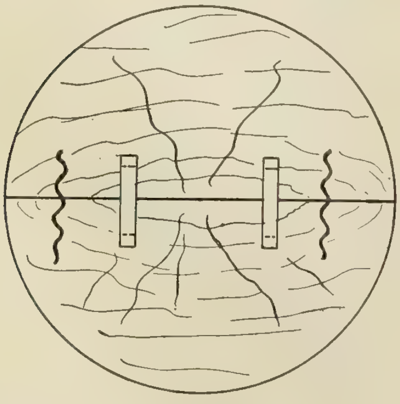


FIG. 29.

Fig. 27 shows the pinch dog which is often used for clamping the two halves of a pattern together while being turned The corrugated pieces of steel, Fig. 28, used by box manufacturers, are the handiest devices for holding small split patterns. They are driven at right angles into the end grain of the wood. Fig. 29 illustrates the method of using the pinch dog and corrugated clamps.

Driving Centre

When turning large work in halves the spurs of the centre, Fig. 24, would not have sufficient bearing to drive the job; the cutting tools employed would just prevent the wood from revolving and the centre would cut a groove in the end of the job.

Fig. 30 shows a device made of iron to be used with the 60° centres. There is a centre line A B scratched across the face and a small hole is drilled at C.

On the driving end is a projection D shown by the broken line, which engages with a slot cut into the face plate.

For the tailstock end a hardwood plate is preferable to an iron one, lignum vitæ being the best wood to use, as it is hard and has an oily surface, thus making it run freely on the tail centre.

When hard wood is used for the tail end, either the 60° centre or the cup centre, Fig. 25, may be used.

There are many devices which will suggest themselves to the practical mind, both for saving time and doing better work in the lathe; some of these will be described as occasion demands when dealing with the construction of different patterns.

NAILS IN MOULDS

WHERE there is danger of angles washing away with the flow of the molten metal, it is a good plan to put in a few thin wire nails to reinforce the sand, nails which have fairly large heads being chosen. The heads of the nails should be slightly rusted by dipping into a not too strong solution of sal-ammoniac and water, and after drying they should be coated with a mixture of equal parts of clay and plumbago reduced to a paint with water. By pressing the heads well into the mould where they are likely to touch the metal, and dressing that part of the mould with plumbago, and sleeking down smoothly, chilled spots will be avoided in the casting. In no case, however, may rusty nails come into contact with the molten metal, or a faulty casting will result.

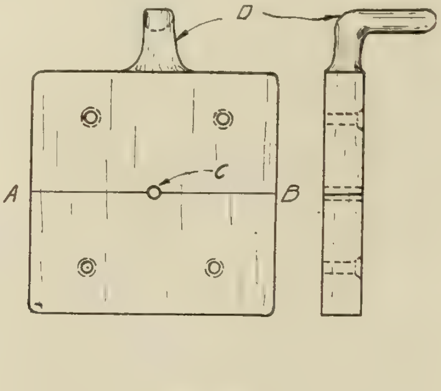


FIG. 30.

THE DANGER IN FLYWHEEL AND PULLEY WORK.

By D. A. Hampson

MOST of us look upon the beautiful curved arms to be seen in the large pulleys of thirty years ago as the work of designers who were architects rather than engineers and a relic of the days when time was not at a premium and iron was cheap. In reality those curved arms served a purpose and did it well. The foundry art had not reached its present high state of development and the curved arms were a protection against contraction strains, and against the cracks that we find, even to-day, where the arm joins the rim. The curve being elastic to a certain extent, was not as rigid as is the straight arm of to-day, and if the arm cooled last, its shape allowed it to give and not break. If the rim was extra heavy and the arm cooled first, the contraction due to the drawing away from the rim simply straightened out a little of the curve and all was safe.

But even with our present experience, the thin rim and the straight arm of to-day continue to give trouble in the shop if a sound casting is not properly handled. Flywheels, with their heavy rim mass and relatively light arms, are hard to cast and easily broken in the shop processes. The trouble occurs where the arms and rim join. If an arbor is forced in or out of the hole or a key driven home or any driving in the direction of the axis, there should be sufficient resistance applied to the hub to take all of the thrust and also the rim supported so it cannot vibrate. To press in an arbor with the pulley resting on the rim and the hub free is only to court breakage. To drive on an arm or the rim is as bad. The iron is already under a strain and the shock of the blow causes even greater strains to be set up and fracture occurs.

The writer saw a key and shaft being fitted to the flywheel of an air compressor. The wheel weighed about a thousand pounds and was stood upright on the floor with a chain hoist to steady the top so it couldn't fall over. The shaft and the key were made a driving fit—both driven home with a 16 lb. sledge and it would have been a dandy job if the hub had been rigidly supported against the blows and the rim had had a positive means of steadying, which the chain did not give. The machine was assembled and started up but no sooner had it reached speed than with a loud report, two of the arms snapped. The wheel had been perfectly sound when machined and while it may have been jarred in handling, the true solution is that the hammering it got in the shop was the cause of breakage.

DANGER-SIGNS

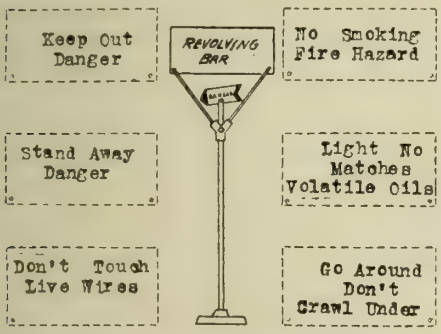
By J. E. Cooley

DANGER-SIGNS are silent sentinels which serve to warn workmen of a possible danger within the surroundings where these are placed. They may be considered as a temporary adaptation to prevent accidents, or for use in an emergency, while other means are being devised for safety purposes.

They should never be used as a permanent means for preventing accidents. For in most cases where a danger-sign has been installed, a safeguard or some acident protective device is required.

In accident-prevention work, little thought has been given to a method for making danger-signs of standard dimensions nor for having them properly worded or of sufficient attractiveness to command one's attention. Except those issued by insurance and other accident liability companies, most danger-signs are but makeshift affairs at best.

Warning notices that are unintelligibly scrawled on boards or paper if not readable by all who approach them are of little worth as such. Then again, if a danger-notice has become torn or soiled, or even removed from position, while no one is responsible for its care or replacement, it follows that accidents are liable to happen.



DANGER SIGN HOLDER AND SUGGESTED NOTICES FOR USE ON SAME.

The work of preparing danger-signs is a part of safety-engineering, equally important with devising safeguards. They should be of elaborate design, of neat appearance and properly placed so that workmen will in all circumstances heed their warning. The same degree of interest, care and attention should be given their design and arrangement as is expected of the workmen in observing precautions for avoiding bodily injuries. If a sign is carelessly made up, and indicates indifference in its preparation, etc., it is to be expected that workmen will show a similar carelessness and indifference to the sign or the place where it is put.

The accompanying sketch shows a few suggestive danger-signs all of standard size and also a design of a sign-holder. Danger-signs, as a rule, are usually tacked up on walls or boards. When so placed, they do not always indicate where the danger lurks. The word "Danger" painted on a sign denotes no particular point or place where attention is required, and are almost valueless because of this omission.

At the top of the rod of the holder is an arrow, that can be adjusted so as to point near, or directly to, the danger exposed. The holder, as seen, consists of an iron base having an upright rod to which is attached a sign-holder at the upper end. The base and holder rods are slit on the points for inserting the sign and arrow. These are held with pins or rivets.

The arrow strip should be about 12 or 14 inches long and of red color. The holder when placed about in zones of danger containing the arrow and sign will be found more serviceable than any devise now in use. Their novelty and attractiveness cannot fail to compel attention from the most indifferent workmen.

WHEEL MOUNTING FOR CYLINDRICAL GRINDING

By Howard W. Dunbar

WHEEL breakage on cylindrical grinding operations is serious for two reasons:

(1) Probability of injury to workman.

(2) The loss of an expensive wheel and stopping of production.

There are many causes for wheel breakage, among them the improper mounting of the wheel on the wheel collar or sleeve. Writing in "Grit and Grinds" the author states that mountings for wheels, or wheel sleeves and collars as they are commonly known, take many different forms depending on the type of wheel to be mounted and the amount of grinding to be performed, but all of them employ the same general principles. Ordinarily in sleeves with small holes, 5 in. for example, the sleeve and the collar grip the wheel on the two outside surfaces so that the collar and mounting extend outside of the width of the face of the wheel; in other words the wheel is not countersunk around the hole to receive the flanges or wheel collars. This is the common type of wheel mounting for general purpose cylindrical grinding.

On special operations other types of mountings are provided which include wheels having large diameter holes and wheels with the sides countersunk so that the wheel is recessed and the mounting is set into this recess, allowing the side of the wheel to pass by any portion of the object being ground which extends out beyond the ground surface.

Cupped, dished, cylinder and ring type of wheels all have their mountings which are peculiar to the wheel and the function that it is to perform. These various forms of wheel mountings, as above stated, employ the same general principles for holding the wheel. In some instances the gripping surfaces are covered with a lining of soft metal, the object of which is to imbed itself in the rough grain surface on the wheel, forming a good gripping medium for holding the wheel in place, not requiring extreme pressure or tightness of the flange and sleeve for retaining the wheel in place. Others provide a series of spots of soft metal having the same object as the soft metal lining. Still others have a plain cast iron surface which is more frequently employed on large hole wheels, as the point of resistance to slippage of wheels in the flanges is brought more closely to the point where the grinding wheel comes in contact with the work being ground. Therefore, the force required to hold the wheel in place is very much less than in the smaller diameter of holes where the gripping medium is farther away from the point of grinding. Other types of mountings require the use of a gasket between the flanges, wheel sleeve and wheel.

In any event, there are certain conditions to be observed in placing a wheel on the wheel sleeve. The more important ones are outlined below:

(1) In mounting the wheel on the sleeve be sure that the wheel slides freely over the center of the wheel mounting. Never put the wheel on when it is necessary to force it on or pound it in place. A slight amount of scraping in the case of a lead center will make a wheel go on freely, or a little rubbing with a rat-tail coarse file in the hole of the wheel having no lead mounting will make the wheel slide on freely.

If the wheel is forced into the mounting when the hole is too small, strains are set up in the wheel, which when clamped by the flanges or the pressure of grinding are apt to cause breakage of the wheel.

(2) Never mount a wheel when the hole is so large that it can shuck about, because such a wheel with a large hole will be very much out of balance and the space left by the opening will make a bridge of the wheel, so that when the wheel is worn down to a point coming close to the diameter of the hole, the pressure from grinding will be sufficient to crack the wheel across this bridge. A wheel mounted in this condition is more apt to slip around than a wheel which fits properly on the center.

(3) Always tighten the wheel sleeve and flanges snugly, especially where the soft metal gasket or blotter is employed, because such holding mediums require a little more pressure to properly mount the wheel and prevent it from slipping on the sleeve. It is difficult to grind pieces round or to size if there is the slightest slippage of the wheel in the mounting.

(4) Do not tighten the wheel sleeve too tightly, particularly where the cast iron or wheel sleeve and flange comes directly in contact with the wheel, without any equalizing medium in the form of soft metal or blotter between them. Too great pressure is sufficient to set up strains in the wheel, particularly where

the surfaces are not perfectly parallel, and the wheel, under the pressure of the grinding operation, will explode or fly to pieces.

(5) Always tap the wheel lightly with a hammer or piece of steel after the sleeve has been drawn up on it properly, ready for placing on the machine, to determine if the wheel by such an operation may have become damaged or broken. A small crack may not be readily seen but can be detected if the wheel is struck lightly with a hammer, for a wheel showing such a crack will not ring clearly, whereas a perfect wheel, or one without cracks at all, will.

(6) Make certain that there are no small pieces of foreign substance, such as steel chips, little pieces of brass, dirt, etc., on the surface of the wheel to be clamped by the flanges and sleeve. Such foreign substances are very apt to set up strains in the wheel which will cause breakage if allowed to remain.

(7) Always inspect a wheel by looking it over carefully and tapping it lightly with a hammer before attempting to put it on the sleeve at all. It sometimes happens that wheels are broken or damaged in transit.

EARLY HISTORY OF THE WIRE-DRAWING INDUSTRY

By J. P. Bedson*

PUDDLED iron was at its zenith in 1872. The process of puddling devised by Henry Cort, who revived the art of making iron with raw coal, the secret having died with Dan Dudley, was on a sand bottom. It required two tons of pig iron to produce one ton of malleable iron, and though this amount was reduced later it was never possible to work with less than 30 cwt. of pig, and the labor was so great that only 2½ cwt. could be treated at a time. Attempts were made to reduce the waste, but it was not till 1820 that Joseph Hall, of Tipton, came upon the solution in the process known as "pig-boiling." That he made for his firm a reputation for quality second to none was largely due to the fettling used for lining the furnace, and much of his improvement in fettling depended on the employment of "bull dog," a calcined cinder from pig-boiling. But even in this improved process the work was most arduous and exacting.

Puddled iron was largely used in the wire trade for all common purposes, such as low-grade telegraph wire, armor for submarine cables, and fencing; but for the higher grades at that time English and Swedish charcoal irons were required, the former being made in the South Staffordshire district and in Shropshire. From 1850, when the first experiments in submarine telegraphy were made by the laying of a cable between Dover and Calais, the wire trade found an increasing demand for its productions, and Mr. Bedson mentioned that half of the wire required for the first Atlantic cable was drawn within 600 yards of the place where his audience were assembled. At the same works the wire was drawn for the first two wire bridges built in the United States by John A. Roebling, one being at Covington, Cincinnati, where the suspension cables were 1,760 feet long and were each composed of 5,200 wires, and the other the Niagara Railway Suspension Bridge.

Continuous Rolling

A patent was granted in 1862 to George Bedson, of Manchester, for his continuous system of wire rod rolling mill, whereby rods could be rolled in 1 cwt. pieces, subsequently increased to 3 cwt., instead of small pieces of rod and coils of 14 lb. The three leading features of this mill were that the door of the heating furnace was placed immediately in front of the first pair of rolls, so that the heated billet when placed in them would draw the remaining length out of the furnace; that the rolls, 16 in number, were placed in line so that No. 1 delivered to No. 2, and so on, each roll being graduated in increased speeds to suit the acceleration of the reduced size of the billet as it progressed to the end of the mill, where the outcoming rods were coiled on suitable reels; and that a twisted guide was provided to present the partly-rolled rod to the succeeding pair of rolls, though this was required only once in the first mills when rolling iron. The rolls in the original mill were placed alternately horizontal and vertical, to give the requisite compression on top and sides alternately.

An experimental mill erected in the Adelphi, Salford, in 1863 proved successful, and was then removed to Bradford Ironworks, Manchester, where it ran till 1884. Of a second mill built in 1866 part is running to-day. A duplicate of it was built in 1867 for Messrs. Washburn and Moen, of Worcester, Mass., U.S.A., and from it, under the guidance of Mr. Charles H. Morgan, sprang the successful adoption of the continuous system of rolling not only in America but on the Continent and, in one instance, in South Wales. There is, however, a Sheffield installation of one of his mills which it is to be hoped will give an impetus to continuous rolling in this country. That system the author pronounced the greatest advance in rolling since it left the hands of Cort.

Another imperfection in the manufacture of wire besides the short pieces —the deteriorating effect of galvanizing on the wire—was remedied by Mr. Bedson in his continuous system of galvanizing, patented in 1860, which secured an excellent coat of zinc on the wire, perfect mechanical adhesions of the two metals, and maintenance of all the ductility and strength of the wire.

Bessemer and Basic Steel

Next came the era of homogeneity, as against the fibrous iron given by puddled and charcoal material. In 1866 a ton of Bessemer steel was drawn, with good results. The material did not, however, displace the qualities of iron just mentioned, but gave the wire-drawer a stronger material in addition, thus increasing his ability to meet higher and extending requirements in engineering design. The treatment was much the same as for iron, except that the steel was heated only to a bright red for the rolling mill, whereas for iron a "wash heat" was required.

Basic steel, the invention of two Englishmen, Thomas and Gilchrist, created a great revolution in wire-drawing. Its great ductility made it ideal for the purpose, and through it the cost has been reduced and the work greatly simplified —so much so, that it would break the heart of a wide drawer to-day if he had to draw puddled iron to small sizes. The general use of basic metal began about 1884, and to-day it holds the premier position for wire-drawing purposes.

Electrical Drive

In 1862 the author left Manchester to put down a wire rod rolling mill, a wire drawing mill, and galvanizing plant at Middlesbrough. He intended to use producer gas as the motive power, except for the rod mill, which was to be steam driven, but before his plans were completed his attention was drawn to what was being done with electrical drive on the Continent. The idea of driving each wire block direct from its own motor, suggested to him by M. Pieper, of the Compaignie de l'Electricité, at Liége, appealed to him strongly. Experiments were made, with success, and a steam-driven dynamo of 600 h.p. was ordered, then the largest continuous current dynamo in the country. At the start over 40 individual motors, varying from 5 to 30 h.p. each, were required. This plant was the first in this country put down as a purely electrically driven plant.

STEEL PLANTS CLOSING FOR LACK OF RAW MATERIAL

THE extent of the depression in the steel industry in the United States as a result of inability to secure raw material is reflected in the fact that only nine of the U.S. Steel Corporation's furnaces in the Chicago district are in operation out of 29. Conditions are about as bad in the Pittsburg district.

Steel manufacturers will put up a strong fight against the movement in Washington to force another readjustment in steel prices. In December domestic consumers were liberal with their orders because prices were adjusted up to April 1. Now that another adjustment is talked of orders have fallen off in the belief that any change will be downward. The plan to establish a different set of prices for each producer, based upon cost of production, is not liked by manufacturers, who take pride in their low costs. They feel that, having brought their plants up to a high state of efficiency, they should not be compelled to accept the same margin of profit as the high cost companies.

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*Abstract of address to Manchester Association of Engineers.

PART I.

The uncovering and reclamation of Canada's mineral resources contribute no insignificant chapter to her national development progress. The subject matter of the accompanying review prepared from official records for the Mail and Empire's Special Trade Expansion Number points to such a conclusion. Following a general reference to the Dominion production as a whole, the hidden wealth of each Province is discussed in its variety detail.

RESEARCH into and the utilization of Canada's natural resources have made gigantic strides during this war-time, and so far as our mineral wealth is concerned there is little doubt, judging by the achievement of the past three years, that its expeditious and profitable extraction is not only assured, but what is of greater importance, its reduction to a state which admits of easy adaptation to the needs of metal-working and kindred industries within our borders is in process of being satisfactorily solved. The designation, Canada's mineral wealth, is no misnomer, and in proof of same, the classification content which follows should be ample evidence.

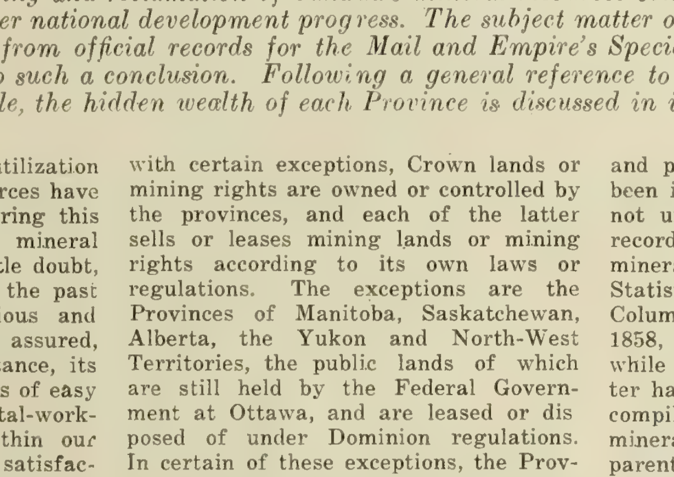
Metallic Products — Aluminum, antimony, cobalt, copper, gold, iron, lead, mercury, molybdenum, nickel, platinum and palladium, silver, tin, tungsten, zinc.

Non-Metallic Products.—Abrasive materials. Actinolite, alunite and pyrophyllite, arsenic, asbestos, barytes, chromite, gypsum, magnesite, manganese, mica, mineral pigments, mineral water, natural gas, peat, petroleum. phosphate, pyrites, quartz, salt, talc.

Structural Materials and Clay Products.—Cement, clay products, lime, sand-lime brick, sand and gravel, slate, stone. Numerous minerals of economic importance occur, widely distributed, in the Dominion of Canada, although even yet only fractions of the probable productive areas have been carefully prospected. Within her boundaries Canada still possesses large areas of great potential importance, and each season is bringing to light new deposits not hitherto uncovered.

Mining Lands and Rights

The conditions under which mining lands or mining rights may be acquired in Canada are not uniform throughout the country, but vary with the different provinces. This is due to the fact that, with certain exceptions, Crown lands or mining rights are owned or controlled by the provinces, and each of the latter sells or leases mining lands or mining rights according to its own laws or regulations. The exceptions are the Provinces of Manitoba, Saskatchewan, Alberta, the Yukon and North-West Territories, the public lands of which are still held by the Federal Government at Ottawa, and are leased or disposed of under Dominion regulations. In certain of these exceptions, the Province, although not controlling the land or mining rights, exercises control over the mining operations; thus the Province of Alberta administers the coal mining regulations, and appoints provincial inspectors for the carrying out of the law. In nearly every case where provincial control is exercised, the making of annual returns is required. There are, however, some provinces in which there is practically no local record and in which the local record covers only certain products.



COMPARATIVE CANADIAN MINERAL PRODUCTION, 1867-1917.

Although the mining of gold and coal and probably a few other minerals had been in progress for many years, it was not until 1886 that any comprehensive record of Canada's annual output or mineral production became available. Statistics of gold mining in British Columbia have been procurable since 1858, and in Nova Scotia since 1850, while statistics of coal sales in the latter have been recorded since 1785. The compilation of records of production of minerals of lesser importance had apparently, however, been given little attention.

Development Grows Apace

In 1886, the total mineral production of the Dominion of Canada was valued at $10,250,000 of which $2,250,000 was for non-metallic structural materials and clay products. Of the balance of $8,000,000, over 70 per cent. was made up of gold, coal, and petroleum; while another 20 per cent. consisted of copper, silver, asbestos, phosphate, and salt. Seven years later, in 1893, production had increased in value to rather over $20,000,000, made up of a little over $5,000.000 in building materials and clay products generally, $10,000,000 in other non-metallic minerals, chiefly coal and petroleum; and a little less than $5.000,000 in metallic minerals, nickel, copper, gold and silver being the more important.

In the immediately succeeding years, the metalliferous ores in British Columbia began to show substantial development. The nickel deposits of the Sudbury district of Ontario had been opened up and were being operated with annually increasing output, while the discovery of the rich gold placers of the Yukon in 1896 resulted in a heavy increase in an already growing mineral production.

Our coal mining industry has made wonderful strides, not only in the Western Province, where new mines are being regularly opened up, but also in Nova Scotia, where the growth of large steelmaking enterprises makes a necessarily heavy demand on coal supplies. The extension and development of our railroad systems have also exerted a stimulating influence on the mining of coal.

In the realm of metallic ores, the development of the large deposits of low-grade copper ores of the Boundary District of British Columbia deserve special mention, resulting as they have in a large and important production of copper from that territory. The discovery and shipment of the rich silver ores from the Cobalt District of Ontario contributed very materially to the enhancement of mineral output values during the last decade.

The growth of the country both in population and industrially has resulted in great activity in the development of non-metallic structural materials and clay resources, while the manufactures of cement, brick, and lime, and the quarrying of stone are growing yearly in value. From 1895 to 1899, the total mineral production increased from a little over $20,000,000 to $50,000,000, and to nearly $66,000,000 in 1901. During the next three years, the output was somewhat less, but increased again in 1905 to nearly $70,000,000. In 1910 the production value passed the hundred million mark, the figures for that year showing the substantial total of $106,823,623. As showing, however, what real intensive application to the development of our mineral resources has accomplished, it is only necessary to state that in 1913 the output value reached $145,634,812, and that for the year 1916 the hitherto unapproached value of $177,357,454 was realized. Anticipations for the present year, based on the available records of the months already gone, are that the $200,000,000 mark will be comfortably passed.

Having in the foregoing dealt with the mineral production of the Dominion as a whole and in a general way, it seems advisable to discuss the resources of each individual province and by so doing demonstrate the contribution the latter make in kind and value to the yearly grand total.

PROVINCE OF NOVA SCOTIA

As far back as 1672, Nova Scotia was known to possess important mineral deposits, but they only began to attract attention in the first part of the nineteenth century, while their exploitation to any considerable degree dates practically from 1830, when the first deep shaft of the General Mining Association was sunk in a coal seam. Statistical records of mining in this Province date back to eighty-two years before Confederation.

In the report of the Chief Gold Commissioner for the year 1862, the statement is made that "the earliest discovery of gold in the Province made known to the public, occurred during the summer of 1860 at a spot about 12 miles north from the head of Tangier Harbor." At this time, coal mining was a fairly well established industry. From these early beginnings, the development and working of some of the mineral deposits have been actively carried on, while others, although promising, still remain undeveloped. Coal constitutes the main mineral product of the Province. The carboniferous formation occupies a large portion of Nova Scotia, covering over half the area of Cape Breton Island, as well as a large part of Cumberland, Pictou, and Hants Counties. Four important coalfields have been developed, viz.: Sydney, Cumberland, Pictou, and Inverness.

Annual Production of Peat.

Calendar Year	Tons	Value
1900	400	$1,200
1901	220	600
1902	475	1,663
1903	1,100	3,300
1904	800	2,400
1905	80	260
1906	474	1,422
1907	50	200
1908	60	180
1909	60	240
1910	841	2,604
1911	1,463	3,817
1912	700	2,900
1913	2,600	10,100
1914	685	2,470
1915	300	1,050

Annual Production of Coal Showing Increase or Decrease.

Year	Short tons	Value	Increase (i) or decrease (d)		
				Short tons	Per cent.
1785 to 1873	*8.592.150	$14.507,000		....	..
1874	1.063,742	1,763.423		....	..
1875	1,039,974	1,747,016	(d)	23,768	2.2
1876	994,762	1,729,546	(d)	45,212	4.3
1877	1.036.670	1.794,415	(i)	41,908	4.2
1878	1,089,744	1.941.285	(i)	53.074	5.1
1879	1,126.497	2,657,194	(i)	356,217	31.6
1880	1,482,714				
		2.050.639	(i)	36,753	3.4
1881	1.537.106	2.688.621	(i)	54.392	3.7
1882	1.848.148	3,248.446	(i)	311.042	0.2
1883	1.818.684	3.109.635	(d)	29.464	21.6
1884	1,984,959	3,593.831	(i)	166.275	9.1
1885	1,920.977	3.417.807	(d)	63,982	3.2
1886	2.116.653	3.739.840	(i)	195.676	10.2
1887	2.429.330	4.388.206	(i)	312,677	14.8
1888	2.602.552	4.674.140	(i)	173.222	7.1
1889	2.658.303	4.894.287	(i)	55,751	2.1
1890	3,084,682	5,676,247	(i)	426,379	16.0
1891	3.577,749	7.019.425	(i)	493.067	16.0
1892	3.287.745	6.363.757	(d)	290.004	8.1
1893	3,783.499	7,359,080	(i)	495,754	15.1
1894	3.847.070	7.429.468	(i)	63,571	1.7
1895	3.478.344	6.739,153	(d)	368,726	9.6
1896	3.745.716	7.226.462	(i)	267,372	7.7
1897	3.786.107	7.303.597	(i)	40.391	1.1
1898	4.173.108	8.224.288	(i)	387.001	10.2
1899	4.925.051	10.283.497	(i)	751.943	18.0
1900	5,777,319	13,742,178	(i)	852,268	17.3
1901	6.486.325	12,699.243	(i)	709,006	12.3
1902	7.466.681	15,210.877	(i)	780,356	15.1
1903	7.960.364	15.942 833	(i)	493.683	6.6
1904	8 254.595	16.592.231	(i)	294.231	3.7
1905	8.667.948	17.520.263	(i)	413.353	5.0
1906	9.762.601	19.732.019	(i)	1,094.653	12.6
1907	19.511.426	24.381.842	(i)	748.825	7.7
1908	10 886.311	25.194.573	(i)	374.885	3.5
1909	10.501.475	24,781,236	(d)	384.836	3.5
1910	12,909,152	30,909,779	(i)	2,407,677	22.93
1911	11,323.388	26.467.646	(d)	1,585.764	12.28
1912	14.512.829	36.019.044	(i)	3,189.441	28.04
1913	15.012.178	37,334.940	(i)	499.349	3.44
1914	13.637.529	33,471.801	(d)	1,374.649	9.16
1915	13.267.023	32.111.182	(d)	370.506	2.72
1916	14,483,395	38,817,481	(i)	1,216,372	9.17

*The total production for the years 1785 to 1873 is made up as follows:—
Nova Scotia (1785 to 1873) .... 8,053,670 tons of 2,000 pounds
British Columbia (1836 to 1873) .... 538,480 tons of 2,000 pounds

The Maritime Provinces, owing to their geographical position on the Atlantic seaboard, were the first in Canada to have their mineral resources explored. In mining, but more especially in the production of bituminous coal, Nova Scotia has for over 200 years had an enviable reputation; while its gypsum deposits, which are among the most extensive in existence, may be said to be only in the primary stages of development.

In addition to these particular resources, an appreciable commerce is carried on in the metallic ores of iron, gold, and antimony, also in minerals of economic value such as dolomite, limestone, fluorspar, and other materials employed in metallurgical processes, besides clays, building stones, etc. In the manufacture of steel on a big scale and by means of the most approved methods, Nova Scotia has shown and continues to show commendable enterprise.

The initial attempt to mine coal was made in the year 1720, it having become necessary to procure a supply of fuel for the men who came from France to lay the foundations of the fortress at Louisburg. The pit openings then made can still be seen at Port Morion, Table Head, etc.

Intensive Development of Resources, Etc.

To the Nova Scotia Steel & Coal Co. and to the Dominion Coal Co. belongs the credit for the development of the coal resources of the Province. On February 1, 1893, the Dominion Coal Co. was organized with a capital of $18,000,000. This corporation amalgamated the coal properties of the south side of Sydney harbor, Cape Breton. With the advent of this big industrial enterprise, a new era in Nova Scotia coal mining began. Mine workings, railway extensions, shipping and discharging facilities were developed, old coal markets expanded and new ones opened up, the result being that the whole coal outlook of the Province was revolutionized. In the first year of the Company's operations (1893), the coal mined amounted to 826,208 long tons, from 8 collieries. As showing the development that has taken place in the interval, the output of 1914 may be cited, the total for that year being 4,800,000 long tons from 20 collieries operating. Due to the labor scarcity since 1914, arising from enlistments, lessened outputs have been the rule, hence the insertion of that year by way of comparison.

In 1900, the Nova Scotia Steel & Coal Co. acquired the later mining rights of the General Mining Association already referred to, and in addition to operating the existing collieries, have opened up new mines, erected iron and steel works which include blast and open hearth furnaces, coke oven plant, etc., all in close proximity to the working collieres. Their Princess Pit was in 1873 the first submarine mine in North America, the coal being won from workings under the sea. The shafts are of unique construction, consisting of metal cribbing or tubbing.

Some six years after the Dominion Coal Co. had been in operation, the necessity for a larger market for its product was realized. Steps were therefore taken by a number of the principal shareholders to establish a steel and iron industry in the vicinity of the coalfields. The advantage, it was believed, would be specially marked during the winter season, as a sure market for a considerable portion of the output would be provided, whereas, after the close of navigation on the St. Lawrence, if the mines are not closed down altogether, it is necessary to bank the produce.

In consequence, the Dominion Iron & Steel Co. was incorporated under the laws of Nova Scotia Province in March 30, 1899, with an authorized capital stock of $20,000,000 common stock and $5,000,000 preferred stock, the par value of each share being $100. A site for the plant was secured within the city limits of Sydney, Cape Breton, which comprises an area of 440 acres. It was valued at $83,000, and was given to the company as a bonus by the city of Sydney. In recent years, the Dominion Steel and Dominion Coal Companies amalgamated under the title of the Dominion Steel Corporation.

Mineral Production of Canada in 1916.

Product.		Quantity.	Value.
Antimony ore (exports)	*Tons	794	$ 48,158
Cobalt metallic and contained in oxide, etc.	Lbs.	841,859	926,045
Copper, value at 27.202 cents per pound	“	119,770,814	32,580,057
Gold	Ozs.	926,963	19,162,025
Iron, pig from Canadian ore	Tons	115,691	1,328,595
Iron, ore sold for export	“	140,608	393,689
Lead, value at 8.513 cents per pound	Lbs.	41,593,680	3,540,870
Molybdenite, MoS2 contents at $1.00 per pound	“	159,000	159,000
Nickel, value at 35 cents per pound	“	82,958,564	29,035,497
Platinum	Ozs.	15	600
Silver, value at 65.661 cents per oz.	“	25,669,179	16,854,635
Zinc, value at 12.804 cents per pound	Lbs.	23,515,030	3,010,864
Total		....	$107,040,035
Non-Metallic.			
Actinolite	Tons	250	2,750
Arsenic, white	“	2,186	262,349
Asbestos	“	136,016	5,183,332
Asbestic	“	18,500	27,147
Chromite, crude ore (a)	“	27,030	299,753
Coal (b)	“	14,428,278	38,797,437
Corundum	“	67	10,307
Feldspar	“	19,166	71,357
Fluorspar	“	1,284	10,238
Graphite	“	3,971	285,362
Grindstones	“	3,328	50,982
Gypsum	“	341,618	730,831
Magnesite	“	55,413	563,829
Manganese	“	979	90,791
Mica	“	914	122,541
Mineral pigments—			
Barytes	“	1,368	19,393
Oxides	“	8,811	58,711
Mineral water	“	....	114,587
Natural gas	M. cu. ft.	25,238,568	3,924,632
Peat	Tons	300	1,500
Petroleum	Brls.	198,123	392,284
Phosphate	Tons	203	2,514
Pyrites	“	309,411	1,084,019
Quartz	“	135,803	241,806
Salt	“	124,033	668,627
Talc	“	10,651	36,475
Tripolite	“	620	12,139
Total		....	$ 53,015,693
Structural Materials and Clay Products.			
Cement, Portland	Brls.	5,359,050	6,529,861
Clay products—			
Brick: common, pressed, paving		....	2,358,245
Sewerpipe		....	716,287
Tile, pottery, refractories		....	1,104,901
Kaolin	Tons	1,750	17,500
Lime	Bush.	5,482,876	1,089,505
Sand and gravel (not complete) (c)		....	1,498,009
Sand-lime brick	No.	13,825,307	113,136
Slate	Sq.	1,262	6,223
Stone—			
Granite		....	1,277,019
Limestone		....	2,326,519
Marble		....	118,810
Sandstone		....	145,711
Total structural materials and clay products		....	17,301,726
All other non-metallic			53,015,693
Total value, metallic			107,040,035
Grand total, 1916			177,357,454

* Tons of 2,000 pounds.

(a) Ore and concentrates finally marketed estimated as 13,834 tons.

(b) Additional returns increase production to 14,461,678 tons, $38,857,557.

(c) Additional returns increase value to $1,734,183.

** Subject to revision.

Annual Production of Coke.

Calendar Year	Short tons	Value	Average per ton
1886	35,396	$101,940	$2.88
1887	40,428	135,951	3.36
1888	45,373	134,181	2.96
1889	51,539	155,043	2.84
1890	56,450	166,298	2.95
1891	57,084	175,592	3.08
1892	56,135	160,249	2.85
1893	61,078	161,790	2.65
1894	58,044	148,551	2.56
1895	53,356	143,047	2.68
1896	49,619	110,257	2.22
1897	60,686	176,457	2.91
1898	87,600	286,000	3.26
1899	100,820	350,022	3.47
1900	157,134	649,140	4.13
1901	365,531	1,228,225	3.36
1902	502,043	1,519,185	3.03
1903	561,318	1,734,404	3.09
1904	554,083	2,032,048	3.66
1905	700,488	2,436,211	3.48
1906	782,055	2,863,503	3.66
1907	842,003	3,583,468	4.26
1908	858,257	3,449,361	4.02
1909	862,011	3,484,393	4.04
1910	902,715	3,462,872	3.84
1911	935,651	3,630,410	3.88
1912	1,411,229	5,164,331	3.66
1913	1,530,499	5,919,596	3.87
1914	1,023,860	3,658,514	3.55
1915	1,170,473	4,258,580	3.64
1916	1,469,741	6,049,412	4.12

The iron ores of Nova Scotia are not confined to any particular geological horizon. In fifteen out of the eighteen counties of the Province, iron ore of more or less extent has been located. Many of these discoveries have been just sufficient to tempt, but not sufficient to reward exploitation; others, again, are found to be valuable. The more important known deposits are those at Torbrook, Annapolis County, owned by the Annapolis Iron Co.; the Londonderry deposits owned and operated by the Londonderry Iron & Mining Co.; and the East River deposits, Pictou County, owned principally by the Nova Scotia Steel & Coal Co. As evidence, perhaps, of the general unimportance of the iron ore resources of the Province, it may be stated that both the Dominion Steel Corporation and the Nova Scotia Steel & Coal Co. derive their ore supply from their properties on Bell Island, Newfoundland.

The gold production of the Province which is derived almost entirely from quartz ores amounted to 6,863 fine ounces of a value of $141,872 in 1862, and reached a maximum of 30,348 fine ounces of a value of $6,627,357 in 1902. It then decreased gradually, reaching

Annual Production of Coke-Oven By-products.

Year	Tar Gallons	Sulphate of ammonia Short tons
1901	2,662,612	1,614
1902	4,094,135	2,393
1903	3,281,249	3,207
1904	1,649,197	1,773
1905	3,407,784	2,500
1906	3,725,723	2,364
1907	4,424,615	1,738
1908	4,450,166	3,342
1909	4,016,824	3,416
1910	3,963,591	3,491
1911	6,464,155	7,124
1912	8,428,896	11,289
1913	8,371,600	10,608
1914	5,714,172	8,572
1915	7,365,931	10,448
1916	9,012,202	11,040

in 1913 a minimum of 2,174 fine ounces of a value of $44,935. Since then, there has been a marked increase in output, and correspondingly in values, the latter showing $60,031, $157,180, and $103,359, for the years 1914, 1915, and 1916, respectively. It may be stated that the decrease in 1916 as compared with 1915 arose from water shortage which interfered seriously with the operation of the hydro-electric plants.

Miscellaneous Mineral Resources

Ores of manganese and barytes have been mined annually but in comparatively small quantities, while there has also been a fairly steady production of grindstone abrasives. Tripolite or infusorial earth deposits have been worked since 1896. From the clays of the Province, widely distributed, there is a substantial annual output of brick and tile products. Marbles, granites and sandstones of excellent quality for building and ornamental purposes are found in abundance, as well as limestone for building, fluxing, or lime-making. Cement and brick are made from blast furnace slag, and the slag is also used for the manufacture of fertilizer. The manufacture of coke is accompanied by the recovery of by-products, sulphate of ammonia, tar, and constituents of high explosives. Ores of tungsten, antimony, and arsenic, have been mined, and tin, lead, and copper ores have been found.

Annual Production of Manganese Ore.

Calendar Year	Tons	Value	Value per ton
1886	1,789	$41,499	$23.20
1887	1,245	43.658	35.07
1888	1,801	47.944	26.62
1889	1,455	32.737	22.50
1890	1,328	32 550	24.51
1891	255	6.694	26.25
1892	115	10.250	89.13
1893	213	14,578	68.44
1894	74	4,180	56.49
1895	125	8.464	67.71
1896*	123½	3,975	32.19
1897*	15¼	1,166	76.46
1898	50	1,600	32.00
1899	1,581	20.004	12.65
1900	30	1.800	60.00
1901*	440	4,820	10.95
1902*	172	4,062	23.62
1903	91	2.775	30.49
1904	66	2,700	41.51
1905*	22	1,720	78.18
1906*	93	925	9.95
1907*	1	22	22.00
1908	Nil	....	....
1909	Nil	....	....
1910	Nil	....	....
1911	5½	300	54.55
1912	75	1,875	25.00
1913	Nil	Nil	....
1914	28	1,120	40.00
1915	201	9,360	46.57

Annual Shipments of Asbestos and Asbestic.

Calendar Year	Asbestos Short tons	Asbestos Value	Asbestos Per ton	Asbestic Short tons	Asbestic Value	Asbestic Per ton
1880 (a)	380	$ 24,700	$ 65.00			
1881 (a)	540	35,100	65.00			
1882 (a)	810	52.650	65.00			
1883 (a)	955	68,750	71.99			
1884 (a)	1,141	75,097	65.82			
1885 (a)	2,440	142,441	58.38	.....	.....	...
1886 (a)	3,458	206,251	59,64			
1887	4,619	226.976	48.92			
1888	4,404	255,007	48,92			
1889	6,113	426.554	69.78			
1890	9,860	1,260,240	127.81			
1891	9,279	999,878	107.76			
1892	6.082	390,462	64.20			
1893	6.331	310.156	86.81			
1894	7,630	420,825	55.15			
1895	8,756	368,175	42.05			
1896	10,892	423,066	38.84	1,358	$ 6,790	$5.00
1897	13,202	399,528	29.99	17,240	45,840	2.66
1898	16,124	475,131	29.47	7,661	16,066	2.10
1899	17,790	468,635	26.34	7,746	17,214	2.22
1900	21.621	729,886	33.76	7,520	18,545	2.42
1901	32.892	1,248.645	37.96	7,325	11.114	1.52
1902	30,219	1,126,688	37.28	10,197	21,631	2.20
1903	31,129	915,888	29.42	10,548	13,869	1.31
1904	35,611	1,213,502	34.08	12,854	12,850	1.00
1905	50,669	1,486,359	29.33	17,594	16,900	0.96
1906	60,761	2,036,428	33.52	21,424	23,715	1.11
1907	62,130	2,484,767	39.99	28,296	20,275	0.74
1908	66,548	2,555,361	38.40	24,225	17,974	0.74
1909	63,349	2,284,587	36.06	23,951	17,188	0.72
1910	77,508	2,555,974	32.98	24,707	17,629	0.71
1911	101,393	2,922,062	28.82	26,021	21,046	0.81
1912	111,561	3,117,572	27.95	24,740	19,707	0.80
1913	136,951	3,830,909	27.97	24,135	19,016	0.79
1914	96,542	2,892,266	29.96	21,031	17,540	0.83
1915	111,142	3,553,166	31.97	25,700	21,819	0.85
1916	136,016	5,133,332	37.74	.....	.....	...

(a) Exports.

PROVINCE OF NEW BRUNSWICK

The mining industry in the Province of New Brunswick appears to occupy as yet a comparatively unimportant position. Gypsum, coal, iron ore, manganese ore, sandstone abrasives, natural gas, petroleum, oil shales, together with limestone, building and ornamental stones of granite and sandstone, form the principal mineral resources, although the occurrence of other minerals has been noted from time to time. With the exception of the gypsum, brick and stone industries, and coal on a small scale, little has been done in the direction of development.

The lack of mineral development activity is, perhaps, hard to explain, except on the ground that attention hitherto has been almost entirely devoted to the great timber resources of the Province, hence little systematic demand for this ore is in the manufac- prospecting for minerals has been undertaken. Iron ores are found in the following localities—Woodstock, Carleton County, where the occurrence of hematite beds has been known since 1863; West Beach, St. John County; Black River, St. John County; Gloucester County on the Nepizguit River, 21 miles from the town of Bathurst.

Copper ores are found widely distributed throughout the Province, but with few exceptions little work has been undertaken. The occurrence of bituminous coal in the Province of New Brunswick has been known for over two hundred years, and while small, seams of more or less importance have been discovered in the interval, the most valuable area remaining is that known as the Grand Lake coalfield, which is situated 70 miles north of the city of St. John, in a direct line between Fredericton and Moncton, and 20 miles east of the former town. The total area of the field is 112 square miles.

The first discovery of antimony was made in 1863, at Prince William, York County, where it occures as sulphide of antimony—stibnite, and as native antimony. Many years ago, the property was worked by the Lake George Mining Co., and a small smelter was erected from which when in full operation a production of about one ton per week was maintained. Unfavorable market conditions and litigation over disputed claims forced the company into liquidation. The property is now owned and operated by the Canadian Antimony Co., we understand. It embraces an area of four square miles of mineral rights, and 440 acres in fee simple. The mineral rights include antimony, gold, and silver, free from royalty. The principal ture of babbitt metal and type metal; smaller quantities are used in enamelling, the manufacture of glass, rubber, and some varieties of paint. In this war-time, not a little antimony is finding a place as a munitions constituent.

The manganese industry of New Brunswick was at one time of considerable importance, but of late years it has not been quite so active, possibly for the reason that the largest known deposits are situated far from shipping facilities, and the cost of transportation is therefore excessive. The surface indications and geological conditions meanwhile justify the belief that in the future a considerable production of manganese will be possible from the mines of the Province.

EMBARGO REMOVED ON METAL ALLOYS

THE Dominion Government has decided for the present and until further notice to permit under license the free export of the metals molybdenum and tungsten, their ores, concentrates, alloys and chemical salts to approved consignees in the United States and France. This will relieve the situation that has been considered somewhat oppressive to Canadian producers.

Since an embargo was placed on the export of these metals the market for the Canadian production has been confined very largely to purchases made on account of the British Government at fixed prices. These fixed prices have been lower, at times considerably lower, than the open market prices offered in the United States and France.

The requirements of the British Government are being met and Canadian producers will now be permitted to take full advantage of the open markets in the United States and France.

It will be necessary for the exporter, previous to shipment, to obtain from the Commissioner of Customs at Ottawa a license to export, and in the case of exports to the United States, it will be necessary under the United States regulations for the shipper or the consignee to obtain from the Bureau of Imports, War Trade Board, Bond Building, Washington, a license permitting the importation of the shipment into the United States.

CANADA'S WAR ORDERS

WAR orders valued at approximately $1,812,000,000 have been placed in Canada since the outbreak of war. This total has been arrived at by "The Monetary Times" as the result of three succcessive investigations and with the assistance of figures supplied by the Imperial Munitions Board, the British War Office Service in Canada, the Department of Agriculture, the Department of Trade and Commerce and the War Purchasing Commission, Ottawa. This vast sum represents an average annual expenditure in Canada of $604,000,000 on shells and general war supplies for three years of war, as little was supplied by us before the end of 1914.

More than half the orders received are represented by munitions. Since the outbreak of war to the end of September last, the orders placed by the Imperial Munitions Board were valued at $925,270,000. Since that date, approximately $75,000,000 of further orders have been placed, bringing the total value of munitions orders up to $1,000,270,000, to the end of 1917. In addition, shipbuilding orders of over $46,000,000 have been placed here.

NICKEL SILVER

THE war has killed the popular name of one of our most useful alloys—German silver. Even before the war the Alloys Nomenclature Committee of Britain had suggested its alteration, since the alloy was neither "German" nor "silver." As a matter of fact, the alloy was introduced from China, and is composed of copper, nickel, zinc. The higher the proportion of nickel (which ranges from 30 per cent. down to 7 per cent), the better the quality of the alloy. The copper is always over 50 per cent., and the zinc varies from 20 per cent. in the best mixtures, to 35 per cent., in "fourth." The alloy is thus really a nickel-brass, and may be so described with precision, but the name is hardly so attractive as nickel-silver, which is the one that will in all probability, except for scientific purposes take the name with the German sound. Nickel-silver in some text books is given the name of "pack-fong." Assuming this to be derived from Chinese, it is, incorrect and should be "pack-tong" "pack" meaning white, and "tong" being the Chinese for copper.

MINERAL WEALTH OF ALSACE-LORRAINE

Frequent reference is made to the mineral wealth of Alsace-Lorraine, it being known that the invention of Thomas and Gilchrist turned that country into a vast gold mine, by rendering its iron ore useful and valuable. The German ambition is to secure also the great iron basin of Briey, the richest and most extensive of all Europe, estimated to contain from 3 to 4 thousand million tons of ore. Thirty miles away Nature has deposited 10,000 million tons of coal in the basin of the Sarre; east of Nancy, partly in France and partly in Lorraine, is one of the largest salt beds in the world; farther east, at Pechelbronn, is an oil district where 30,000 tons of mineral oil are extracted yearly; and finally, more to the south, near Mulhausen, is a wonderful deposit of potash, rivalling that of Stassfurt. Germany before the war was very poorly off for iron. In her own territory she had only 710.000.000 tons in sight. Her conquest of 1871 gave her a reserve of over two thousand million tons in Lorraine, but in spite of this she was lately obliged to import 12 million tons from Sweden, Spain, and Algeria, and was looking to Morocco to aid her supply, whence the "Agadir affair."

* * *

TO deaden the noise from trucks rumbling over a concrete floor, a factory has successfully used a heavy tar paper pasted to the floor by paint. The method of application is as follows: The floor to be protected is first given one coating of grey cement paint. On the following day when the paint is thoroughly dry, a second coat is applied. At the same time one side of a five ply tar paper is painted and when both paper and floor are still wet the paper is carefully laid, wet side down, on the floor and rolled with either a roller or wide tired truck until all signs of air pockets beneath the paper disappear. The surface seems to improve with age and very effectively reduces noise at a low cost to the lowest possible minimum.

1917 TOTAL TRADE REACHES MAXIMUM

INTERNATIONAL trade of 1917 will show a larger total than in any earlier year. This estimate, appearing in "The Americas," issued by the National Bank of New York, is the result of a careful review of all available figures of world trade for the year 1917. It includes eleven months' actual figures for the United States and United Kingdom, ten months for Canada, and somewhat shorter periods for the year to justify an estimate that the total international trade of the year will be the largest in history. In the case of the United States the total trade of the year is estimated at approximately nine billion dollars, against less than four billions in 1913. In Great Britain the total for the eleven months is over seven billion dollars, against five and three-quarter billion dollars in 1913.

Canada's total for ten months ending with October is over two billion dollars, against $88,000,000 in the same months of 1913, and Japan for the nine months ending with September, $914,000,000, against $507,000,000 in the corresponding months of 1913. For France no official figures are available for 1917, though the imports estimated by an examination of figures of export from other countries to France are apparently about 50 per cent. more than in 1913.

In the Central Powers no official figures are available, though it is known that their over-sea trade is, of course, cut off; they have imported very largely from adjacent neutral countries, and the exchanges between the countries forming the group now known as the "Central Powers" have also been very great. In the Allied countries a part of their trade, that conducted by or on behalf of the Government, has been omitted from the official figures.

Allied Figures

The largest change is that of the Allies. The total trade of Great Britain, France, Italy, Russia, United States, Canada and Japan in 1913 was a little more than eighteen billion dollars, while the figures thus far reported for the current year suggest that their total for 1917 may approximate twenty-five billion dollars.

Oriental trade of 1917 will somewhat exceed that of 1913. In Japan exports are double those of 1913, and imports show an increase of about 50 per cent. In China the imports show a decline, and while there is a good demand for her silks at high prices, the best markets for her tea have been difficult of access. India shows a decline in imports and a slight reduction of exports, due chiefly to lack of transportation. The great rubber plantations of Ceylon, the Malayan Peninsula and the Dutch East Indies, however, show large increases in their production and sales, and the sugar output of Java was larger and at higher prices than formerly.

The neutral countries of Europe show material increases in the value of their exports, but slight decreases in the value of their imports.

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CANADA'S FUEL CONTROL ORDER

THE recent order of the Dominion Government suspending the operation of manufacturing plants for three days and the further restrictions placed upon theatres, clubs and other places of amusement brings home to the people of this province our dependency upon the United States for our fuel and also calls attention to the urgent need of conserving what fuel we have. It is needless to add that every manufacturer or other user of power, large or small, has a very clearly defined duty to perform in this regard.

Proper firing, clean boilers, well lagged steam lines and all other improvements effecting economies in various ways, not only are directly to the manufacturers' advantage but are of direct intrinsic value to the country at the present time.

According to first reports the Canadian order goes considerably farther than the American in some respects in that all munition plants must close for the three days.

IS ENGINEERING ABILITY APPRECIATED AT ITS TRUE WORTH?

THE extent to which engineers of all grades have been called upon to participate in the war,—not, it is true, in the fighting line pure and simple, but in the production, supply and maintenance of all the gear necessary for the conduct of operations on present-day lines,—has done more to inform the world of its indebtedness to the engineering industry than would have been accomplished in fifty years of agitation along constitutional lines. Acknowledgement, however, must be made to Germany for having recognized the potential and active value of engineers, and for having encouraged to the point of insistence their education and training as part of the nation's business. That their value as wealth producers in peace and destroyers in war was also most fully recognized by that nation has been borne in upon the Allies only too well.

In considering the engineer as a factor in civilization, it is convenient to classify his efforts under three sections—first, the pure scientist who reasons and deduces; second, the applied scientist who searches, develops and demonstrates; third, the commercial scientist whose ability influences every line of industrial effort from making tacks to building "tanks." The third section embraces the great bulk of the profession, yet, except in the case of well-known men who have achieved fame as manufacturers and also of notable subordinates employed by them, its members are not brought prominently into the fierce glare of general publicity, while, in discharging their duties in any large aggregation of employees, their natural reservedness and acceptance of conditions as they are militates against a true recognition of the real value of their services.

The buoyant, assertive salesman, glibly recounting totals from his sales sheets, impresses all with his indispensability to his employer. Without him there would be no sales, with no sales no money, with no money no job. Therefore, all hail the salesman. How often though does the real and primary state of affairs dawn on those in authority? That the truth does occasionally come home is known to a few close observers, but that the man, who produces the wherewithal for the salesman to juggle with, gets, on the average, anything like the same thanks, tangible or otherwise, is a very rare occurrence.

The extent to which civilization has rested on the industrial accomplishments of man, the degree in which science and industry have contributed to the physical welfare and comfort of humanity has engendered, so gradually as to be almost unnoticed, a complete dependency on the engineer. The deprivation of numerous essential commodities, the excess of demand over supply, the search for equipment and materials for new processes, all these and other contributory conditions have to a considerable extent reversed the roles of salesman and engineer, and the man who can design and produce is, for the first time in years, valued at something approaching his true worth.

The chief feature in future business will be the ability to deliver the goods. For years to come the salesman must play the part of a man who goes out to look for known conditions, not to produce unsound demand and inflated sales. His success will be directly dependent on the confidence with which he can rely on the producer at home—if he knows that varying conditions will be met with cheerful adjustment, that unfair opportunities for excessive profits will not be snatched up viciously to the undoubted detriment of future business, if he will realize that without the goods he is helpless, then, perhaps, he may reconcile himself to being placed on an equal footing, both as to reward and prestige, with the man who gives him the wherewithal to barter.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery,
Equipment, etc., Used in the Plating and Polishing Industry.

CORROSION OF IRON ON STEEL AND ITS PREVENTION—I

By Abe Winters

As the various sulphur compounds act upon silver, covering the surface of it with a film of sulphide of silver which is black, so the oxygen of air acts upon iron, especially when moisture is present. Sulphur which is usually present in the air in some form or other, acts upon a great many metals to some extent when the latter are exposed to the air. Gold is not affected by sulphur or oxygen and is therefore referred to as one of the noble metals.

Sulphur emitted through the pores of the skin will discolor silver ornaments worn by many persons; this fact is particularly noticeable when sulphur is used for medical purposes. Sulphur causes a decided discoloration on silver surfaces but does not necessarily corrode the metal as in the case of oxygen and its effect on iron or steel. Moisture assists the action of oxygen on iron—the surface of the iron being burnt or oxidized and an oxide of iron formed—this we term rust.

John Ruskin is credited with a very beautiful reference to iron as a metal which breathes the air and so gives life to every living thing. If iron could not be oxidized, or rusted we should not exist on the earth. It is the rusted or oxidized iron that gives color to various soils and minerals, it is this rust, which, when dissolved by water forms food for plants and gives the foliage its green color. It is this rust also by which we get iron into the blood and which gives it its red color. With this consideration of iron rust we may be permitted to regard iron as indeed a noble metal. Generally speaking we consider iron rust as a nuisance, it ruins the most magnificent structure of iron or steel as well as the most trivial toy: yet, because iron can rust by action of the air, the metal deserves a place among the noble metals. When the surface of iron rusts, a certain amount of the oxygen of the air is added to the iron. This oxygen has weight and its weight is added to the weight of the iron when the iron is rusty. This oxide of iron, or rust, is easily reduced to powder form and will crumble away under the action of wind or water or any friction against the iron, therefore the iron will lose, not only the oxygen tht it has taken into itself, but also the part of the iron which has combined with e oxygen.

Relative Corrosion of Iron and Steel

The difference in the rate of corrosion between iron and steel as given by acknowledged authorities varies greatly. The reason for this is plain: the conditions of each reported rate of corrosion, whether the result of laboratory or commercial tests, such as exposure to weather or other corroding influences, not being similar in all respects, are therefore comparable only in a general way.

Experiments conducted by the English Admiralty, various research bodies, international boards of trade and European shipbuilding concerns prove that steel corrodes much more rapidly than iron when exposed to the action of salt water, also that the commoner brands or iron corrode less rapidly than the better grades when exposed to the same influences. No tests of modern rust proofing processes can be considered complete unless the tests include practical application of the salt water action on iron or steel.

Another point to bear in mind is that corrosion tests should not in general be carried out to the limit. The severity with which such tests are carried out should depend upon the stage at which the metals are to be discarded in practice or the condition of the protective coating after reasonable service under usual circumstances.

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PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

It cannot be too strongly emphasized that the task of satisfactorily determining the relative corrodibilities of iron and steel is one of immense difficulty in view of the numerous factors involved. The more important factors are as follows:

Necessity for Representative Samples

(1) Since the metals are made in such a variety of ways and with such varying chemical compositions, it is essential that a very large number of samples be taken. This is where the majority of the investigations are at fault, with the result that the conclusions, although excellent for the field they cover, are not based upon sufficient data to render them of very great practical value.

Standard of Corrodibility

(2) A method that is adopted very largely at the present time is based upon the loss of weight undergone by the metals when the rust produced by varying media has been removed. In the absence of pitting the results are thoroughly trustworthy and of great valve. But certain kinds of corroding media favor the development of serious pitting, and in these cases the mere determination of total superficial loss in weight may not prove particularly helpful. For example, it is conceivable that a grey iron casting might loose several pounds in weight through uniform superficial corrosion, and yet not be much the worse. On the other hand, a single ounce removed as a result of pitting might be sufficient to perforate the metal and lead to very disastrous consequences. A determination of the depth of the pitting is of the utmost importance.

Corroding Media

(3) No one type of metal must be expected to resist equally well all kinds of corroding media.

One metal may prove most suitable for resisting neutral corroding agencies, such as tap water or fresh air, whilst another excels in its resistance to the effects of salt water. Two steels may yield amost identical corrosion factors when subjected to various neutral influences, but in 0.5 per cent. sulphuric acid one sample may corrode two and a half times faster than the other sample. It is therefore evident that the nature of the corroding medium must be known before a reliable opinion can be expressed as to the best metal to resist the same.

Composition of the Metal

(4) Steels offer a very wide range for variation of composition, but for the present we are only concerned with those more common types that are used for such purposes as will bear commercial competition with wrought or cast iron. The main chemical differences are thus confined to variations in the carbon and manganese contents. At the present time the influence exerted by these two eliments, both singly and together, upon the corrodibility of iron has not been thoroughly investigated. Extensive researches on this problem are being carried out but it is too early to discuss the results in detail. It has been observed however that small variations in the manganese content of the metal influence to a very appreciable extent the resistance toward corroding media.

Physical Condition of the Metal

(5) Iron and steel are, from the nature of their manufacture, particularly liable to segregation and to variation in physical conditions. Modern improvements have tended to minimize the differences between wrought iron and steel, but its doubtful whether the variations

in the physical condition of steel will ever be completely corrected.

Results of Experiment and Experience

More work has been carried out along these lines than the average reader realizes, and a few references to some important cases may prove useful:

Howe and Stroughton in 1908 exposed samples of American iron and steel to various corroding media. Consideration of their determinations shows that there is little difference between the corrodibilities of the iron and steel as exhibited in the tests of 2 years duration. Howe and Stoughton also gave the results of an examination of 29 pipes used in the signal systems of an American railroad, 12 of which pipes were steel and 17 iron. Nineteen of these were practically destroyed by corrosion and pitting, the average life of the iron was 10.4 years while that of steel was 13.5 years. Here the steel has the decided advantage.

Ira Woolson, in *Engineering News*, Dec., 1910, reported on 80 samples; 17 samples were wrought iron, the remainder being steel. No appreciable difference in corrosion was observed. W. H. Walker in 1912 found by 64 comparisons that:

Iron corroded more than steel	20 cases
Steel corroded more than iron	18 cases
Steel and iron corroded equally	9 cases
Corrosion negligible	17 cases

On the whole therefore there was no difference between the two metals.

Conclusion

The results of many other investigations bear a similar interpretation. We may therefore conclude that, whilst the mean result of examining a large number of samples of iron and steel after exposure to corroding influences indicates that the two metals are practically equally resistant, yet a very wide divergence exists between the different irons and steels in individual cases. This is not necessarily due to any irregularity in the metals themselves but in the majority of cases is attributable to the fact that no one metal can be expected to offer an equal resistance to all types of corroding media.

The question to be considered when contemplating the manufacture of durable iron or steel products is not so much as to whether iron is better than steel or vice versa, but rather—which is the best variety of iron or steel for a specific purpose.

Questions and Answers

Question.—I am employed as nickel plater and buffer at a certain rate per hour, but now the company want me to do the work on a percentage basis, percentage to be based on polishing prices. Do you know what percentage I should receive for plating and buffing?

A cleaner which I prepared and used gave good results, with no work spoiled, but the company object to the use of the material necessary for the solution and have given me a compound which does not yield as good results, for the nickel frequently peels. I want to use a muriatic acid dip for the work after removing the latter from cleaning solution. The superintendent claims an acid dip is not necessary. Kindly give me you opinion.—An Old Reader.

Answer.—In order to advise you consistently regarding proper percentage rate for a scale of prices for plating and polishing certain products, it would be necessary for us to know the polishers' rate of pay, the character of the product to be plated and buffed, and the facilities provided for these two operations. Our estimate could only be approximate as the conditions vary so greatly in different plants that a system which proves successful in one plant may prove a failure in another. It would no doubt be a simple matter to arrange a satisfactory rate for buffing, but the percentage plan for plating is seldom a success in small shops where the plater is required to work according to the ideas of a dictatorial supervisor such as you describe.

The material you mention as being ordered to replace the cleaning material you have been using is used extensively on various wares and gives good results if properly used. The stripping of nickel plate from steel surfaces after cleaning by electro method is quite frequently caused by an invisible soap film which remains on the surface of the steel. The use of a reverse current for an instant just prior to the removal of the steel from the cleaning solution will often remove the film and prevent failures in plating. If you cannot use the reverse current as mentioned above, we would suggest a quick rinse in warm water directly after removal from the cleaner.

If you are nickeling directly on the steel after cleaning by electro method, it would certainly be wise to use an acid dip prior to immersion in the nickel bath. The cleaning solution is alkaline and the water used for rinsing quickly becomes contaminated. The metal retains small traces of this alkali and when placed in the acid nickel solution presents a surface condition which is not conducive to the adherence of the nickel deposit. An acid dip neutralizes the alkali and gives the steel surface the required "bite" to receive the nickel deposit by proper union of the two metals.

The acid most naturally adapted to use before nickeling is sulphuric acid, as there are no conflicting chemical reactions resulting from the accidental introduction of small quantities into the nickel solution, furthermore, muriatic acid is more difficult to remove from the metal surface by rinsing and is frequently the cause of premature decay in nickel deposits by reason of corrosion of the steel or iron beneath porous nickel deposits on metal dipped in muriatic acid solution. If you can use a dilute sulphuric acid dip direct from the cleaner, rinse and transfer to nickel bath, thus eliminating the muriatic dip, we believe you will obtain more adherent and durable deposits.

With specific reference to your employers, we would advise you to co-operate with them to the limit of practical common sense, conditions at present time are far from normal and if Canadian manufacturers ever deserved the kind indulgence of their employees they do at present. The proposals offered or the refusals made are possibly the result of present market conditions and deserve your careful consideration. Employees proving themselves interested in the success of a firm during these strenuous times will merit a share in the ultimate success after the war. Try the suggestions offered by the superintendent and if you fail, request him to demonstrate the merits of his idea. If you are in the right and he fails, your troubles will grow rapidly less, if he is a practical man.

* * *

Question.—The interior of several small ventilator hoods which surmount our acid dipping jars is beginning to corrode badly. The hoods are of black sheet iron, painted. We wish to inquire what coating could be used that would endure longer than the paint, and be easily applied.

Answer.—Remove the hoods if convenient to do so, clean the portion to be coated, the best plan being to clean and coat entire hood, inside and outside. If sand blast is available, clean by this method. When all traces of rust are removed from the metal, brush on a thin coating of the following mixture: Pitch, 1 part; resin, 1 part; plaster of Paris, 1 part. After coating is hardened, give the edges, corners and angles an extra coating.

This mixture forms a hard semi-lustrous coat which is very resistant to either acid fumes or direct action of acids. It may be used as a lining for tanks which are permanently and solidly located. Tanks subjected to changing positions should be coated with a more elastic material to prevent cracking the coating during strain.

* * *

Question.—Can you inform me of a simple rust preventative which includes copper salt as one of essential substances used, and is used as a dip.

Answer.—You will require two solutions for the process. Immerse the iron or steel in a warm solution of copper sulphate, 1 pound sulphate per gallon of water. Rinse, and immerse in a strong solution of sodium hypochlorite maintained at about boiling point. This gives a blue-black film which is very resistant to corrosion. Metal surfaces subjected to friction are not benefited by this treatment. If a final treatment in hot oil bath is given the metal the results will be greatly improved.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	$50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 62 00
Antimony	18 00
Copper, lake	32 00
Copper, electrolytic	32 00
Copper, casting	31 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 20
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 38
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 78
Linseed oil, boiled, single bbls.	1 42
Linseed oil, raw, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 15
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 9 50	$ 9 00
Sheets, black, No. 10.	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard buishings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 50%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50	to	$0.54
Cobalt	1.75	to	2.00
Copper	.36	to	.38
Tin	.86	to	.88
Silver, per oz.	1.05	to	1.00
Zinc	.14	to	.16

Prices per lb.

NAILS AND SPICES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .20
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.08
Ammonium, chloride	.11
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Arsenic, white	.10
Caustic soda	.07
Copper, carbonate, anhy	.50
Copper, sulphate	.16
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate .....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.46
Sodium cyanide, 98-100%	.38
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, singl and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.95
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.			$3 25
Polishing wheels, bullneck			2 00
Pumice, ground			07
Emery composition	10	to	12
Tripoli composition	06	to	09
Crocus composition	08	to	12
Rouge, powder	.30	to	.35
Rouge, silver	.50	to	.55

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd.	0 43
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 55
Copper tubing, seamless	0 60

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P H and Imperial	50
Globe	50
Vulcan	50
Disston	50

The General Market Conditions and Tendencies

apply to Central Canada, from Fort William, Ont., to Riviere du Loup, Que.

TORONTO, Ont., Feb. 5.—The fuel regulations ordering a general closing down of factories and munition plants next Saturday to Monday inclusive will cause considerable loss to the concerns involved, but the situation has become so acute that something must be done. The continuous severe weather has badly handicapped railroad operations and increased the already severe traffic congestion, with the result that the movement of coal from the border has not been sufficient to take care of pressing requirements. It is estimated that in Toronto alone the saving of coal will be about 5,000 tons. The fuel regulations

Steel

Conditions in the steel trade continue unfavorable owing to the severe weather which has prevailed for several weeks. The railways have been badly handicapped by the low temperatures, and the yards are still congested, with the result that shipments are coming in slowly. For this reason there is no improvement in the coke situation, which continues acute, and the shortage is interfering with the manufacture of steel, and relief cannot be expected in this quarter until the supply of coke is materially increased. The cold weather is also interfering with manufacturing operations at the steel plants, restricting production considerably. Adverse operating conditions will likely prevail for the balance of this month. The demand for steel for commercial purposes is showing some improvement, but deliveries have been retarded by the freight congestion. Conditions in the trade in the United States are such that steel is even more difficult to obtain than was the case a few weeks ago. Production of steel has declined on account of the severe weather, but the demand is as insistent as ever. The mills consequently are getting behind on deliveries. The freight embargo and the fact that deliveries are in a chaotic condition is still the main topic of conversation in the steel industry. New business is being held in abeyance until the situation shows signs of clearing. War orders, having first call on the available supply of steel, are consuming a greater part of the material being imported, leaving a comparatively small tonnage for ordinary consumers.

No further statement has been given out regarding the proposed increase in the production of steel in Canada. It is understood that plans are being made to utilize the full capacity of the steel plants and ultimately increase the output when satisfactory arrangements have been made in regard to securing ample supplies of raw materials. Little progress can be made in this direction until the spring, when operating conditions will be more favorable. The labor situation will also have to be investigated, as an increase in supply will be necessary to meet the demand arising out of the new conditions. There has been no official confirmation of the contract which the Canadian Car & Foundry Co. is said to have secured for freighters to be built at Fort William for the U. S. Government. It is reported that the whole of the material for the contract has been arranged for with the U. S. Government, and that construction will commence in May. There have been no price changes announced this week and the market is firm.

Under the new regulations steel plants and foundries will have to close down next week-end, Saturday to Monday inclusive. This will mean that production will be further curtailed for the time being, although it may relieve the situation later. The output of the Nova Scotia Steel & Coal Co., for the fourth quarter, 1917, shows an increase in production of ore and limestone and also finished steel and forgings, but a decline in coal, coke and steel ingots. The following are the figures in tons for the quarter ending Dec. 31:—Coal, 135,273; ore, 36,111; limestone, 19,513; coke, 18,850; pig iron, 21,304; steel ingots, 29,216; finished steel and forgings, 25,199.

The T. Eaton Co. has awarded the contract to the Dominion Bridge Co. for 8,000 tons of structural steel for a mail order department building which is to be erected near the harbor front in this city. This is additional to the contract for 20,000 tons for the retail store at Yonge and College Streets, held in abeyance until after the war. The Dominion Bridge Co. and McGregor & McIntyre, of Toronto, participate jointly in a contract calling for 1,800 tons of steel for a shipbuilding company.

Pig Iron

The situation in the pig iron market is worse rather than better, conditions not having been improved by the severe weather, which is preventing the free movement of coke to the furnaces. Production has consequently been considerably curtailed and the furnaces are getting behind on their orders. Canadian consumers are buying iron from the United States; among these are included makers of agricultural implements who are buying in limited tonnage for foundry use. The situation across the line shows no improvement, and a number of furnaces are still banked due to lack of coke. The continued cold has done much to counteract the relief which would have resulted from the five-day suspension order. Foundries and other plants not working on war orders are practically unable to get iron.

Scrap

The market continues dull, with a small volume of business. The outlook in the trade is still somewhat unsettled, due to conditions in the States, where new regulations are anticipated following a reorganization of the sub-committee on scrap iron of the American Iron and Steel Institute. Prices of copper and brass scraps are a shade weaker, but only the latter have declined in the meantime, new brass cuttings and No. 1 brass turnings being down 1c. Heavy melting steel and machinery cast iron, on the other hand, are firmer, and have advanced $1 a ton. The railway situation is discouraging all attempts to do business, as shipments are constantly being held up for indefinite periods.

Machine Tools

The machine tool market is fairly active, the demand being principally for equipment for munitions plants, although a few orders have been received by local dealers for machinery for general purposes. The report that a shipbuilding plant will be established at Fort William has created considerable interest in machine tool circles, although no official statement has yet been made The Dominion Shipbuilding Co. is looking around for equipment for its new plant at the foot of Spadina Avenue. This concern will participate in the contracts for ships under the new Government scheme. In the States there is great activity in the machine tool trade, which is affecting deliveries in equipment destined for Canada.

Supplies

Business in machine shop and mill supplies continues brisk, due principally to the activity in the munitions industry. Prices are very firm, with an upward tendency, due to the lack of raw materials, which is also creating a shortage of a number of lines, particularly on those imported from the States. Dealers have to place orders considerably ahead to ensure getting the goods when required.

Metals

The non-ferrous metal markets are as a rule quiet and devoid of any outstanding feature of interest, except perhaps that the prices of zinc have been fixed by the U. S. Government, although the figure has not yet been given out. The copper market continues a routine affair, while the shortage of tin is still acute, with no relief in sight. Lead is firm, and some scarcity has developed. Antimony is firm, but aluminum is easier. Solders have advanced.

Copper.—The copper market is dull, but prices have shown no indication of going below the price fixed by the Government, and it is believed that if there should be an advance in the fixed price there would be very little copper for sale. The production situation is not as satisfactory as is desired, as there is not any enthusiasm for new development or for extension work. It is said by copper men that the rising cost of doing business, including the higher taxes, and the fact that the selling price is limited, has so reduced the probable profit that new capital cannot be attracted to any work in the industry that requires taking more risk than the average in other lines of business. Lake and electrolytic are unchanged at 29c and casting copper at 28c per pound.

Tin.—There is no improvement in the tin situation, and the shortage continues acute. In New York the trade is demoralized, as all arrivals and also tin in store are commandeered by the Government. There are no spot supplies of tin available, so no spot market can be quoted. The outlook is not favorable either for lower prices or ample supplies. The situation is thus very uncertain. Prices locally are entirely nominal at 80c per pound.

Spelter.—It is reported that the War Industries Board has fixed the price of grade "A" spelter at 12c, but this has not had any effect upon the general market, which has been left to establish its own prices. The demand is light and prices steady at 9½c per pound.

Lead.—The market is firm and scarce in the East, due to congestion of traffic. The scarcity is, however, temporary, as an improvement in the railway situation will relieve the tight conditions in the market. The "Trust" price is unchanged at 6.75c New York. Lead is quoted locally at 8¾c per pound.

Antimony.—The market is quiet and business dull. Antimony is unchanged at 18c per pound.

Aluminum.—The market is very dull, there being more buyers than sellers. Aluminum is quoted locally at 60c per pound.

Solders.—Prices of solders have advanced on account of the tin situation, guaranteed being quoted at 44¼c and strictly at 40½c per pound.

Foundry Facings and Supplies

Made by us in Canada are guaranteed to give you utmost satisfaction.

Every User Likes

Imperial Ceylon Plumbago No. 101

It is the highest grade facing on the market to-day, as a test will prove. Its use is wise economy.

Imperial Ceylon Plumbago No. 206 is without equal for general machinery castings.

Imperial Black Core Compound is guaranteed 100% pure. Users commend it highly.

Imperial Parting is ordered and re-ordered by our customers. It is always equal to the severest tests. May we send you a sample?

Imperial Special Stove Plate Facing is backed by our experience of a quarter century. It is a perfect facing. You should use it.

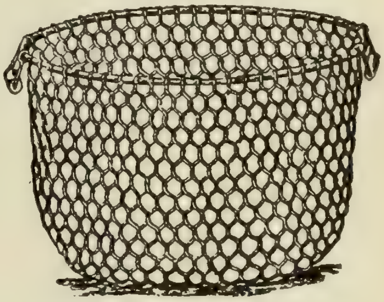
We carry a large stock of each line we advertise.

The Hamilton Facing Mill Company, Limited

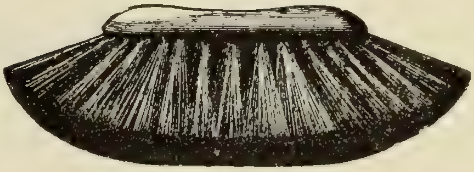
HAMILTON - - ONTARIO

MADE IN CANADA

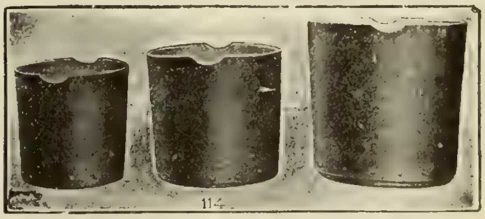
Coke or Charcoal Basket



Made of Strong Galvanized Steel Wire



A Brush much in favor in Foundries everywhere



Highly Serviceable Foundry Ladles

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

TRADE GOSSIP

Vancouver, B.C.—The Canadian Metal & Equipment Co. propose establishing a smelter at False Creek.

The International Malleable Iron Co., of Guelph, Ont., has increased its capital stock from $250,000 to $500,000.

Owen Sound, Ont.—William Kennedy & Sons are making structural alterations to the steel foundry and machine shop.

Banff, Alta.—The Alberta Electro-Chemical Co. contemplate installing machinery for the manufacture of carbide in their plant at Kananaskis Falls.

John Meston & Co. has been incorporated at Victoria, B.C., with a capital of $10,000 to carry on the business of iron founders and mechanical engineers, etc., at Victoria, B.C.

William Allan Foley, who for some years was superintendent for Goldie & McCulloch Co., Galt, Ont., died in that city on Jan. 27, in his 75th year. The deceased had lived in Galt over fifty years.

Engineering and Machine Works of Canada Ltd. has been incorporated at Ottawa with a capital of $1,000,000 to take over as a going concern that part of the Jenckes Machine Co's. business heretofore carried on at St. Catherines,

Fort William, Ont.—The Canadian Car and Foundry Co. plant is about completed. Early next month the work of making cars will be commenced, when 1,100 men will be employed, increasing to 1,500 and 1,700 as the capacity of output is reached.

The Allan & McKelvie Engineering Co., has been incorporated with a capital of $50,000, at Victoria, B.C., to acquire and take over as a going concern the firm of Allan & McKelvie of Vancouver, brass, iron and steel founders, marine and mechanical engineers, etc.

Canada and U.S. Pool Steel Supplies. Arrangements are in progress between the Canadian and United States Governments for pooling supplies of steel for shipbuilding purposes in connection with the Canadian policy of shipbuilding under Government operation or control of shipyards.

U.S. Government Buys Platinum.—A tentative price of $90 an ounce has been set by the U.S. Government for the purchase of 21,000 ounces of platinum recently imported from Russia. Bankers in Petrograd who financed the collection of the metal will be allowed to produce proof of the expense incurred if they think a higher payment should be made.

U.S. Zinc Prices Fixed.—A report from Washington says that zinc prices have been agreed upon by representatives of the Government and the producers, and will be announced soon. In requesting that the Government name prices, as has been done with copper and steel, the zinc producers said such action would stabilize the market and increase the output.

The Standard Machinery & Supplies Co. of Montreal are now representing the F. B. Stevens Co. of Detroit, Mich., manufacturers of foundry facings and supplies, etc. The company will handle the complete line of Stevens products throughout Canada, with the exception of Ontario.

Armstrong-Whitworth of Canada, Ltd., have closed their office in the Dominion Bank Building and opened a warehouse at 130 Wellington Street, Toronto, in charge of J. L. Hynes, where they will carry a complete stock of high-speed steel, carbon tool steel, gauges, shop tools and special munition tools.

The Standard Machinery & Supplies Co. of Montreal have been appointed sales agents for the Atlas Crucible Steel Co. of Dunkirk, N.Y. They will handle the various lines of high-speed and carbon steels in the whole of Canada, with the exception of a part of Ontario. In Ontario the territory includes Renfrew, Pembroke and east of those points.

Shawinigan Falls, Que.—The Canadian Aloxite Co. are building a factory here for making aloxite and carborundum. The buildings cover a wide area and are of steel construction. The aloxite mixing building is 60 x 162 ft.; the carborundum building, 60 x 113 feet; the aloxite building, 59 x 162 feet, and the main building, comprising offices, machine shop, boiler room, etc., 64 x 160 feet. The Church, Ross Co., of Montreal, are the contractors.

International Engineering Works Control Changes.—A majority of the stock of the International Engineering Works, Amherst, N.S., has passed into the hands of a syndicate composed of several leading Canadian business men and manufacturers. The company will be reorganized and placed on a more satisfactory financial basis. A circular recently issued states that the company sustained a loss with its munitions contracts during first nine months of 1917

Copper Price Extended.—On Jan. 23 President Wilson approved the recommendation of the War Industries Board that the maximum price for copper fixed upon its recommendation by the President and announced September 21, 1917, be continued in effect upon the same conditions until June 1, 1918. The maximum price under this action will be 23½ cents per pound f.o.b. New York, subject to revision after June 1, 1918, upon these conditions.

Government Railways Will Have More Cars.—The Canadian Government railways are in need of seven million dollars' worth of extra rolling stock in addition to four million dollars' worth of equipment already contracted for. Officials of the railways are now discussing with the government methods for obtaining them. Of the seven millions, three millions are to be used for the purchase of passenger cars, and the remainder for box cars and a number of locomotives. The new equipment will not only be used on the government lines but will also be utilized to assist other lines which are at present hard up for equipments.

Toronto, Ont.—The Bond Engineering Works, Ltd., which took over the Queen City Foundry, will build an addition to the foundry, the contract having been let to Chas. W. Wood & Son of Toronto. The building is to be single storey, with monitor solid brick walls, roof of standard slow-burning construction. Despite unfavorable weather the work is progressing rapidly. The Bond Engineering Works is a subsidiary of the well-known transmission manufacturers, the Bond Foundry & Machine Co., Mannheim, Pa.

Must Restrict Consumption of Gas in Ontario.—The task of relieving the fuel crisis in Western Ontario caused by the inadequate supply of natural gas has been put up to T. A. Magrath, Dominion Fuel Controller. The Ontario Railway and Municipal Board, which conducted as extensive investigation a week ago into the situation in Sarnia, Windsor, Chatham and several of the border towns, has arrived at the conclusion that the situation can only be met by restricting the consumption of gas in radical fashion—by giving domestic consumers first call upon the supply. But the board, while convinced that domestic users should be supplied first, has found that it has not the power to interfere with contractual rights.

Canada Foundries & Forgings Have Good Year.—At a meeting of directors of the Canada Foundries & Forgings Co., a concern having plants at Brockville and Welland, preliminary figures for the business of the year 1917 were submitted, and contained the evidence that the business of 1917 had considerably exceeded in volume that of 1916, while the profits for the year were fully equal to those of 1916. This was considered very satisfactory in view of the experience of many Canadian companies during the past year. The report respecting the Delaney plant at Buffalo fully justified the expectation of the directors and the plans they had in taking over the plant. The company has sufficient business booked to keep it busily occupied for the remainder of the year. The usual dividends were declared.

Steel Plant for Vancouver.—The Hon. Wm. Sloan, Minister of Mines for British Columbia, states that Vancouver may become the headquarters of a large electrical smelting and steel plate industry. It is reported that the B.C. Provincial Government has been engaged in negotiations with eastern capitalists and electrical smelter experts. The negotiations have now reached a point where the government has agreed to join with the Pacific Steel Co. of Eburne, the Aetna Iron and Steel Co. of Port Moody—in which companies, the Tudhope interests of Orillia, Ont., and R. F. Turnbull, a well-known electrical metallurgist of Welland, Ont., are identified, together with other interested parties—in inviting an eminent outside metallurgist to visit Vancouver and make a final

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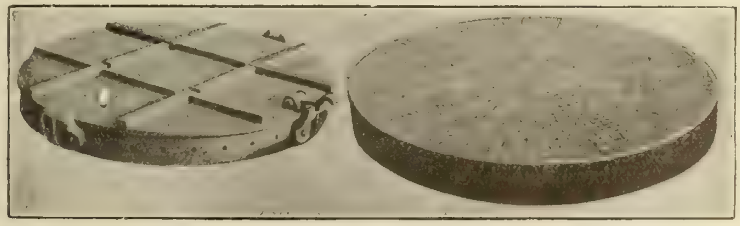

report on the proposal to establish a steel plant here. It is understood if the final report proves satisfactory the government will extend the company its aid and influence."

High Speed Steel Prices Fixed in U.S.—The committee on steel and steel products of the American Iron and Steel Institute has recommended the following fixed prices on high speed tool steel. Mill shipments $2, and shipments from makers' warehouse stocks $2.01 base per pound. All prices f.o.b. point of shipment and net without discount. Tungsten finishing steel 65c per lb., on mill shipments and 66c on shipment from warehouse stocks. A long list of extras has also been submitted.

Steel Concern Changes Name.—An interesting development in the steel trade of recent date has been the absorption of the well known Sheffield concern the Eagle & Globe Steel Co. by Arthur Balfour & Co., Dannemora Steel Works Sheffield, England. In future all Canadian business will be carried on under the name of Arthur Balfour & Co., and no change will be made in the Canadian offices, except in the name as stated above. W. A. Bradbury, 123 Craig St. W,. Montreal will continue as general Canadian agent.

U.S. Steel Production Cut in Half.—It is estimated that the average steel production of the United States to-day is but little over 50 per cent. capacity. Operations at 50 per cent. capacity mean a loss of some 1,750,000 tons of steel monthly as long as the present situation continues unrelieved. And steel men can see little prospect of an early betterment. In some quarters it is thought that labor is responsible to some extent for the present tie-up of industry. Owing to the demand for workers it is claimed that laborers have assumed an independent attitude and are working carelessly and producing considerably below their ability.

Steel Men Interview Munitions Board.—Representatives of the steel companies were in consultation at Ottawa last Thursday with the Imperial Munitions Board. It is understood the steel manufacturers object to the inspection results and would change the present system. At present the British Government employs an inspection company to pass upon the output of the munition manufacturers and of the steel for munitions. The rejections have been of so great a percentage as to alarm the producers, who allege that unskilled men are being used as inspectors. It is improbable there will be any change in the inspection system.

A. D. Armitage has been appointed president of the Whitman & Barnes Mfg. Co., Akron, Ohio, and St. Catherines, Ont., in succession to A. B. Rinehart. Mr. Armitage has been continuously connected with the company 25 years at its three factories and offices in Akron, Chicago and St. Catherines, Ont. He started as mechanic in the Akron factory Sept. 1, 1892, became purchasing agent in 1900, was transferred to the Chicago factory in 1902 and made superintendent of that plant in 1904. In 1908 the board of directors elected him general manager of the three factories and manager of sales for Canada. At the annual meeting in 1915 he was elected vice-president and manager of the Chicago and Canadian factories with charge of sales at those offices. His various official positions at the three factories and offices during his period of connection with the company particularly fit him for the office of president.

Smelters Operating at High Efficiency.—Plants of the Consolidated Mining and Smelting Co. at Trail, B.C., are now operating highly efficiently according to Managing Director J. J. Warren. By the installation of most modern machinery and the prompt adoption of the latest practicable improvements, the company is now able to turn out fully as much metal with its present staff of 1,200 men as with 1,600 several months ago. So that it is able to maintain its output in spite of the heavy reduction in staff due to enlistment in the army; and moreover, a considerable economy is affected by the saving of some $40,000 a month in wages. "The plants of the company have been built primarily to take care of the peace needs of Canada, in the metals it produces; so that war orders are only incidental to the successful operation of the company, and not absolutely essential, as in the case of some corporations. In this connection it is pointed out that the company will be able to continue a steady regular business when there are no more war orders to be obtained."

BOOK REVIEWS

Principles of Iron Founding, by Richand Moldenke, E.M., Ph.D.; 517 pages, 6 x 9 in., illustrated; published by McGraw-Hill Book Co., Inc., New York. Price $4.00 net, postpaid.

Following this is a brief outline of iron metallurgy dealing with the relation of iron to each of the principal elements met with in foundry work, after which chapters V to XIII deal with properties, materials, processes and results, the properties of cast iron being dealt with in 80 pages alone.

To progressive foundrymen in the western hemisphere, the name of Moldenke is indicative of all that is authentic in iron founding, and this book, which embodies the principles developed by the author during an exceptionally efficient lifetime, is an excellent example of a modern technical treatise. It deals directly and lucidly with the basic principles underlying the best modern foundry practice, and contains just sufficient historical data to make the foundryman realize the dignity of his calling and the dependence of modern civilization on the accomplishments of the moulder and cupola man. The manufacture of iron is traced from ancient times down through the development of it in Europe and latterly in America. The second chapter, dealing with the industrial status of the foundry contains desirable information regarding allied industries and their relation to the foundry—i.e. the status of the foundry in relation to manufacturing enterprise, producers of raw materials, purchasers of castings commerce and finance, exporting and banking; inter-foundry relations; association activities; internal foundry conditions. Chapter III. deals with foundry organization.

The treatment of the various sections is particularly complete, technically accurate, and possesses a readability equalled by few technical works and excelled by none.

TRADE GOSSIP

B. C. Mineral Production.—Revised estimates of the value of the mineral production of British Columbia for 1917 show the total will be approximately $37,500,000. This is a falling off from the total of 1916 of $4,790,000.

The Dominion Metallurgical Co. has been incorporated at Ottawa with a capital of $250,000 to manufacture iron, steel, alloys of all kinds. The chief place of business is Toronto, and the incorporators are H. A. Harrison, W. M. Cox and W. N. Robertson, all of Toronto.

Bituminous Coal Production in 1917.—The 1917 bituminous coal production in the United States is put at 544,000,000 tons, an increase of 42,000,000 over 1916, in preliminary estimates to-day by the Geological Survey. Fuel Administration officials had expected the total to be more than 550,000,000 tons, but a falling off in output in December reduced the figures. December's production was the smallest of any month since last April, due principally to car shortage. The last week of the month showed great improvement over previous weeks, but in that week the mines were operated at only 88 per cent. of their total capacity.

Nova Scotia Industrial Production.—It has been estimated that in 1917 the following values were produced by the industries of Nova Scotia:

Coal	$23,600,000
Coke and by-products	5,000,000
Gold and other minerals	250,000
Gypsum, limestone, etc.	1,250,000
Building materials and clay products	450,000
Iron and steel products	20,000,000
Fisheries	10,092,000
Manufactures, ships and freights	47,750,000
Products of the farm	36,117,203
Products of the forest	4,500,000
Game and furs	500,000
Total	$149,509,203

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MAGAZINE for FEBRUARY

John Bayne Maclean Robert W. Service
Agnes C. Laut George Bernard Shaw
Archie P. McKishnie Alan Sullivan, *et al.*

The Ending of the War—When? How?

JOHN BAYNE MACLEAN writes with amazing courage and information about the war situation, past and present, in the February issue of MACLEAN'S MAGAZINE. He tells of the bungling of politicians in Britain and elsewhere—men of Cabinet rank who baulked the military and naval leaders, and in his exposures he includes some military and naval men. What Colonel Maclean writes rubs some men the wrong way—those who have "ostrich minds." But the whole English-speaking world is Colonel Maclean's debtor for publicly stripping away the concealments of truth, and letting the world see things as they actually are. Colonel Maclean's contribution is entitled **"Why We Are Losing The War."**

The Eternal Irish Question

this time dealt with by that surprising, bold-thinking, unharnessed man, **George Bernard Shaw.** Mr. Shaw puts the Irish Question forward in a fresh way, and proposes a novel—yet not impracticable—solution. Writing in trenchant style, and always sensibly, Mr. Shaw is worth reading. MACLEAN'S MAGAZINE shares with a London (England) daily paper the right to publish this article by Mr. Shaw. In passing, we desire to suggest to you that the class and quality of articles and contributors which MACLEAN'S MAGAZINE is securing are matters for all Canada to have pride in.

It scarcely needs to be said that such a wealth of good reading matter, much of it of first-class current interest, makes MACLEAN'S MAGAZINE take its place fairly alongside the best magazines in the world.

FICTION

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A strong story of adventure by **Archie P. McKishnie.**

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Another long instalment of the secret service serial by **E. Phillips Oppenheim.**

THE MAGIC MAKERS

Second instalment of the strong Canadian serial story by **Alan Sullivan.**

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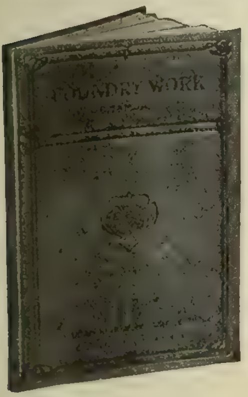

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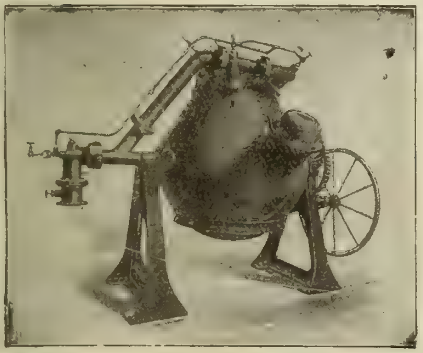

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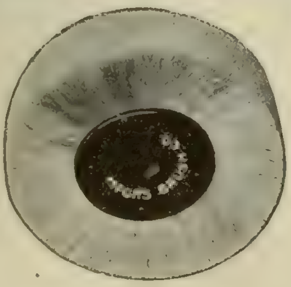

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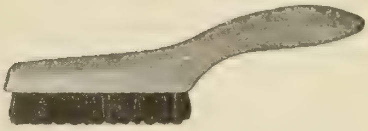

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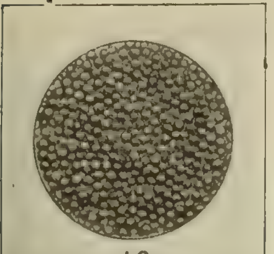
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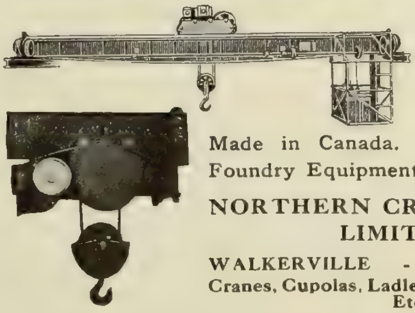

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CASTINGS, GREY IRON
Castings of Ottawa, Ltd., Ottawa, Ont.

CASTINGS, NICKEL
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United Brass & Lead, Ltd., Toronto, Ont.
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CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.

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Obermayer Co., S., Chicago, Ill.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Stevens, Frederic B., Detroit, Mich.
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Whitehead Bros. Co., Buffalo, N.Y.
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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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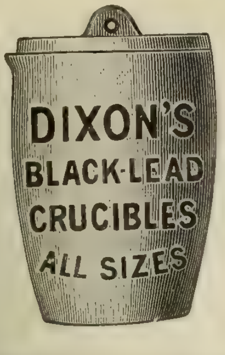
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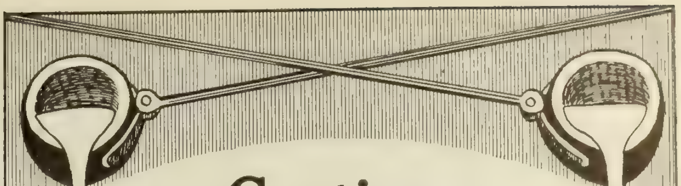
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Mott Sand Blast & Mfg. Co., Brooklyn, N.Y.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST GRIT AND SHOT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST SAND
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Whitehead Bros. Co., Buffalo. N.Y.
U. S. Silica Co., Chicago, Ill.
E. J. Woodison Co., Toronto.

SAND BLAST SHOT
Globe Steel Co., Mansfield, Ohio.
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago, Ill.

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Sly, W. W., Mfg. Co., The, Cleveland, O.
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Whitehead Bros. Co., Buffalo, N.Y.
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

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Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago. Ill.

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Hyde & Sons, Ltd., 12 Bleury St., Montreal.
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Hyde & Sons, Ltd., Montreal, Que.
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Hyde & Sons, Ltd., Montreal, Que.
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Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Ltd., 12 Bleury St., Montreal.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

VIBRATORS
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Ltd., 12 Bleury St., Montreal.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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Dom. Iron & Steel Co., Sydney, N.S.
Hyde & Sons, Ltd., 12 Bleury St., Montreal.
Woodison, E. J., Co., Toronto. Ont.

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Can. Hart Wheels, Hamilton, Ont.
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Ford-Smith Machine Co., Hamilton, Ont.
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United Compound Co., Buffalo, N.Y.
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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Ltd., 12 Bleury St., Montreal.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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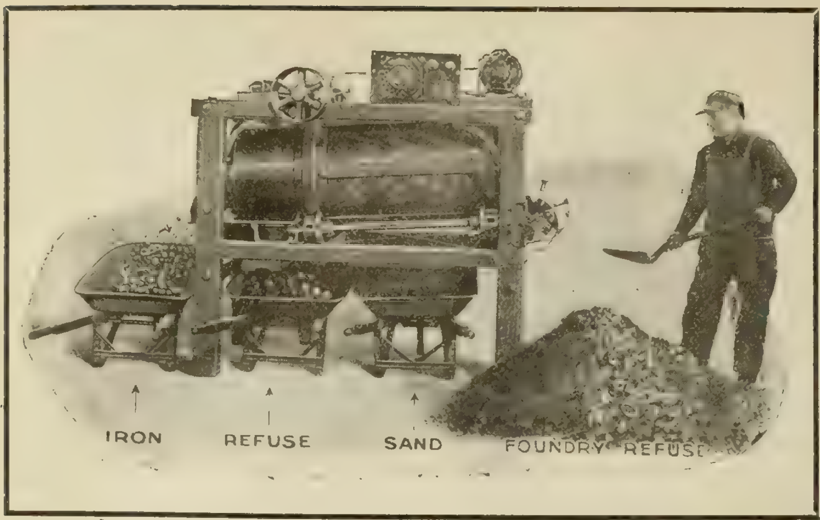


It Spouts the Reclaimed Iron

into the third wheelbarrow; the worthless refuse into the second, and the sand into the first, as illustration clearly shows.

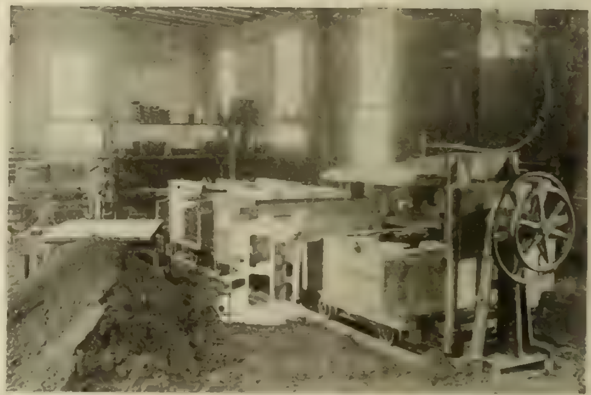
DINGS

Never-Clog Magnetic Separator

Rescues all metal and all sand. It is warranted never to clog on any foundry refuse a shovel handles.
All iron is dislodged from the magnets without the aid of belts, scrapers or any other device. And there's no danger of burning out coils; they're wound with magnet wire.

Write for Bulletin No. 16

DINGS MAGNETIC SEPARATOR COMPANY
800 Smith Street Milwaukee, Wis.



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The Most Convenient and Most Efficient Molding Machine on the Market.

Built on the principle that the **Centre of Gravity is the Centre of Rotation**—it is perfectly balanced and the largest flask can be easily and smoothly turned by one man.
Requires less than half the number of steps necessary with rockover machines, and consequently saves much time.
For continuous and economical work you cannot find a more efficient molding machine.

Write to-day for descriptive catalog.

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811 W. Jefferson Ave., Detroit, Mich.

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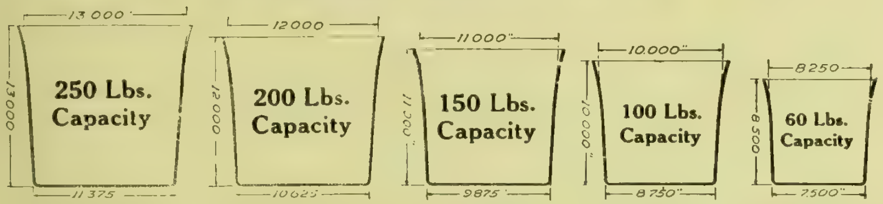
Let Me Send You a Sample of this Bowl To-day

Stevens New Style Stamped Steel Ladle Bowls



Made of 5 32" Steel
Made of 1/8" Steel
Made of 1/8" Steel
Made of 1/8" Steel
Made of No. 14 Gauge Steel

If you could purchase a Steel Bull Ladle that was made of extra heavy steel you would consider that something gained, wouldn't you?

If, further, it was made without any seams, joints or rivets, you would think it had arrived pretty nearly at a state of perfection.

If, when you tried one, you found out that it would outlast three of the ordinary Ladles, wouldn't you jump for joy?

And, when the bill came, if the price was practically no more than you had been paying for the flimsy, ill-shapen ones of former years, wouldn't you think it was IT?

That is just what hundreds and hundreds of foundrymen have already found out from the trial and service of my New Style Stamped Steel Ladle Bowls. From the Atlantic to the Pacific these Bowls are used in preference to any others and repeat orders are coming in continually. There is every reason why YOU, as well as others, should take advantage of this NEW Ladle construction. You have only to look into it yourself. See them. I make it easy. Am just now sending out samples by express, prepaid. Let me send yours at the same time. Write me to-day. Ask for a sample Bowl.

And Let Me Send You One of these Shanks at the Same Time

These are made with extra heavy cast steel band—instead of forged band which makes them twice as strong—ONE HUNDRED PER CENT. STRONGER than the old kind.

No breakage—no accidents—long life. Steel foundries—as well as other foundries—swear by them.

Made in the styles shown in the illustration. Am also sending out samples of shanks. Write for a sample Shank at the same time you ask for a sample bowl.

Single End Shank

Double End Shank

Double End Swivel Shank

FREDERIC B. STEVENS

Manufacturer Foundry Facings and Supplies, Buffing Compositions and Platers' Supplies

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WAREHOUSE and OFFICE: Corner Larned and Third Street
EXPORT WAREHOUSE: Windsor, Ontario
NEW ENGLAND BRANCH: Frederic B. Stevens, Corner Water and Olive Streets, New Haven, Conn., E. E. Seeley, Manager

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ROYLITE CHEMICAL CLEANING COMPOUND

ROYLITE

The Best Cleaning Compound Known

Saves Time Saves Labor Saves Money

ROYLITE Cleaning Compound will be found to be one of the greatest discoveries furthering the interests of the Electro-plating Trade, through its increased agencies in removing greases and oils from all metals in the most economical manner. Never before has such unvarying success been discovered. Unlike other chemical cleaners Roylite does not destroy the greases or oils, at the same time destroying itself, but throws these greases and oils from the work, leaving the metal clean and bright. Trials which have been conducted universally with searching thoroughness prove that Roylite is the most economical, rapid, harmless, and lasting compound on the market to-day.

Roylite will clean all metals in a more satisfactory manner more quickly than by the old method of using caustics, which frequently leaves the work showing streaks and discolorments.

Roylite will not tarnish in the process of cleaning and has a tendency to brighten the metal to a noticeable degree.

ELECTRIC CLEANER

Roylite makes a splendid electro-cleaning compound, and we highly recommend it for this use as well as a still cleaner.

Roylite is manufactured by us in Canada, and we are therefore able to give you prompt service at a less cost than cleaners made in foreign countries.

We are prepared to demonstrate the use of Roylite either in our demonstrating plant in Toronto, or in your own plating plant if you so desire, and solicit your correspondence.

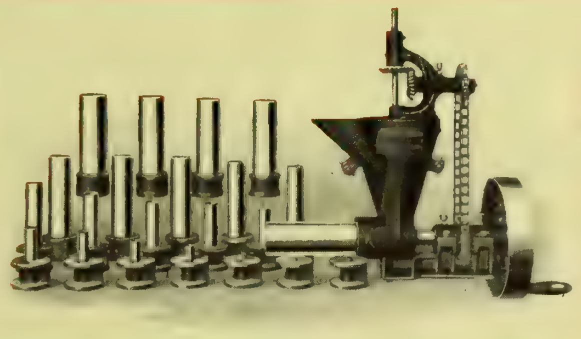
WRITE US TO-DAY. ***WE CAN SAVE YOU MONEY.***

CANADIAN HANSON & VAN WINKLE CO., LTD.
TORONTO, CANADA

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, MARCH, 1918 No. 3



The Hammer Core Machine

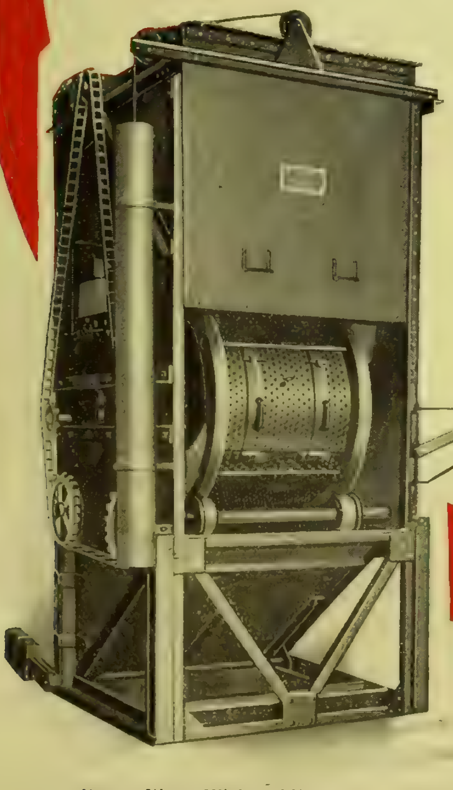
BROWN FOUNDRY EQUIPMENT

is making good in big and little foundries from coast to coast—because every part is well designed and built to stand up under the hardest kind of service.

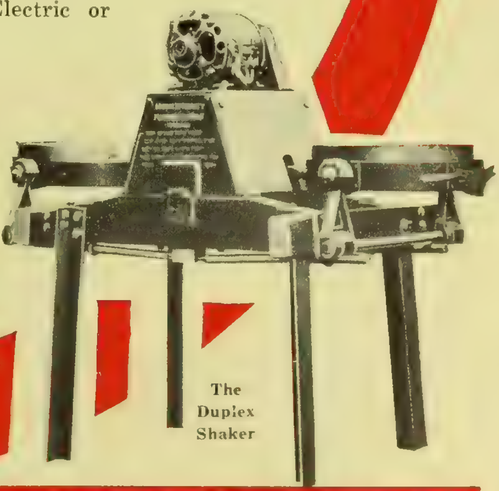
BROWN SANDBLAST MACHINES are made in rotary table and barrel types. With a minimum supply of new sand, both types give a thorough and uniform cleaning of all castings—iron, steel or non-ferrous. The barrel machine is arranged for quick and easy loading and automatic unloading—no time is lost.

THE HAMMER CORE MACHINE is a money-saver in the core room. It can be arranged to make any style or size of stock core required. Not only does it save labor but it gives perfect cores in less time. Made in three sizes with either hand or motor drive.

THE DUPLEX SHAKER sifts the molding sand quicker than it can be done in any other way. It has cut sand-labor costs in two in over five hundred foundries. Electric or pneumatic drive.



Front View With Sliding Door Raised



The
Duplex
Shaker

Brown Foundry
Equipment means
Foundry Efficiency.

Write for complete catalogs and details.

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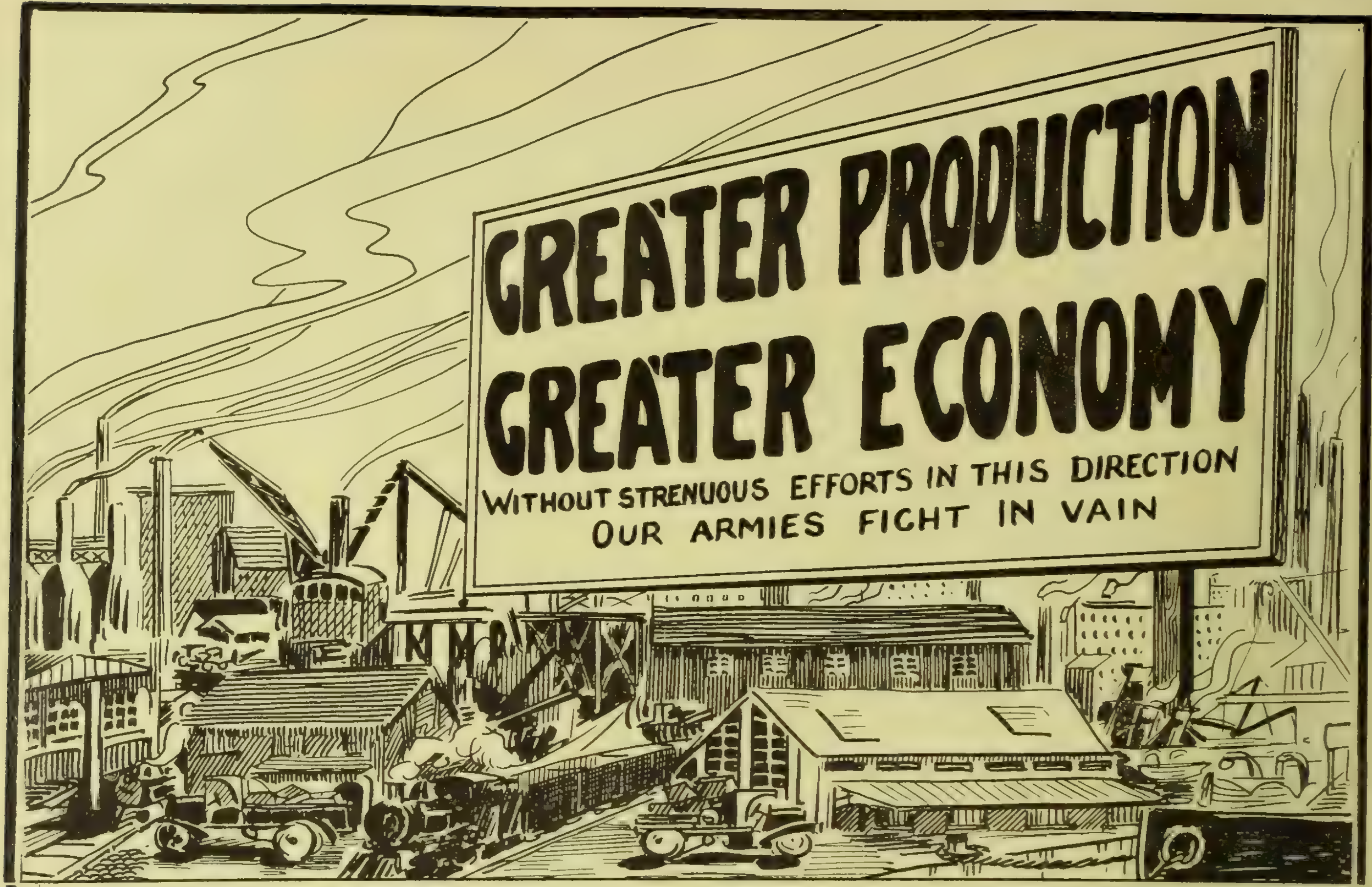
GREATER PRODUCTION
GREATER ECONOMY
WITHOUT STRENUOUS EFFORTS IN THIS DIRECTION
OUR ARMIES FIGHT IN VAIN

KAWIN Service Paves the Way!

War has become greatly a thing of economics, of **commerce**, of **industry**.

Therefore **greater production** and greater **economy** are twin factors of your business which it behooves you to study and practice with the utmost zeal in the interests of the allied cause. The men who guide the nation's affairs have emphasized and given much publicity to this vital necessity.

Are you doing your best to **produce** and **economize?**

You may be doing your best—but there is not much doubt that the expert help that the KAWIN SERVICE can give you would advance your production and put your business on a more economical running basis than is the case at present.

100 % Results or No Charge

KAWIN SERVICE is guaranteed to save you one hundred per cent. over and above its cost.

Have our representative call upon you to explain the details. Write.

KAWIN SERVICE sends an expert, practical foundryman to your plant; he devises the best moulding and cupola practice; advises the best means of purchasing raw materials and in a dozen different ways shows you the best route to bigger and more economical production.

SPECIAL—Kawin Service is growing. An **Industrial Engineer** of high repute, a **Practical Foundryman** of broad experience, and a **Fifth Laboratory at Buffalo, N.Y.**, are being added to our service. All of which our Canadian Clients will share in the benefit. Full details later.

Charles C. Kawin Company, Limited

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See Next Issue Regarding Details of Our Buffalo Laboratory

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"Made in the House that WOODISON built"

Will not rub off—Stays where you put it—Lays nicely to the metal—Peels perfectly. Remains in suspension so does not settle or require constant mixing.

Cost is nominal—Results obtained prove superiority—Best for Cores, Dry Sand and Loam Work.

ORDER A BARREL ON APPROVAL

The E. J. WOODISON COMPANY

Toronto Montreal Windsor Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle

The Publisher's Page

TORONTO MARCH, 1918

CONDITIONS AFTER THE WAR*

By LT.-COL. THOMAS CANTLEY

Chairman of the Board, Nova Scotia Steel and Coal Co.

ALTHOUGH the transition from war to peace conditions—whenever it may come—must cause some temporary difficulty and disorganization, there is a confident feeling that there will rapidly develop a huge demand for the products of the steel industry in order to make good the devastation of war, and also to cover the vast arrears of commercial work which have been so long held up.

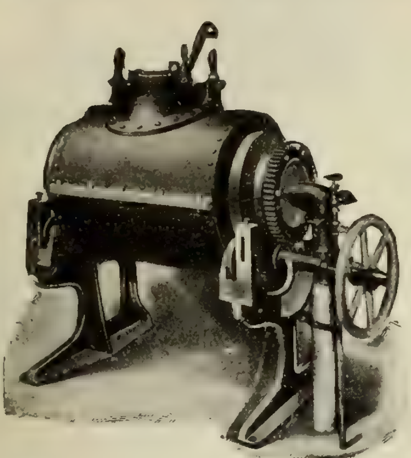
There is the further fact that the world scarcity of food, the devastated farms, manufacturing plants, towns and homes of Europe will make for an enormous immigration to Canada, to accommodate which will cause the opening up of vast new agricultural areas, with a consequent demand for railways, bridges, buildings, tools and implements. The prosperity enjoyed by the agricultural population should also result in a very great demand for farming implements. Railway equipment and rolling stock in Canada, and in fact the shortage of railway equipment throughout the world, is great, while needed replacements are not being made, and there is a veritable famine for equipment of this character everywhere.

These facts seem to lead to the inevitable conclusion that while there may be a slight hiatus immediately following the war's end, within a very short time thereafter Canada will embark on an era of unexampled and unprecedented development and prosperity, while the iron and steel industry of the Dominion will be one of the first to participate.

May the day soon dawn when Canada's heroic sons, who have so gloriously battled for liberty and world freedom, will be triumphant and free to return to their homes and again take their place in their old-time peaceful pursuits, honored by all for what they dared and what they have done.

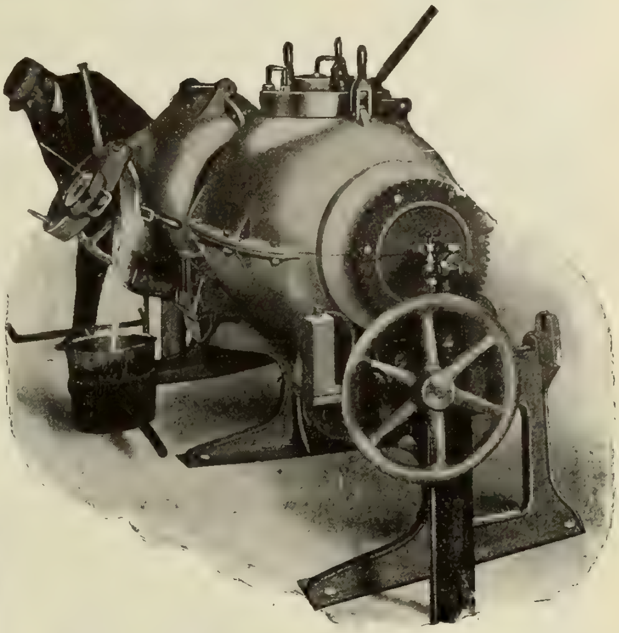
***Extract from an article in "Industrial Canada"**

WE BUILD "CORE OVENS"



Monarch Rockwell Single Chamber Furnace—"Simplex"

Bur
Oil
or
Gas



Monarch Double Chamber Melting Furnace

The Recent Fuel Order

helped to emphasize the advantage of using

Monarch Melting Furnaces

The Government fuel order was aimed at the consumption of coal and coke, all of which goes to show the real scarcity of these commodities. Monarch Melting Furnaces burn OIL or GAS, COAL or COKE, and if you will use them you will be independent of the limited supply of other fuels.

Further, Monarch Melting Furnaces save up to 50% in fuel costs.

"Monarch Rockwell" Double-Chamber Furnace, without crucibles, melts almost twice as much metal as any other furnace without additional cost for fuel. It utilizes all the heat from its one burner. While melting in one chamber, exhaust heat brings the metal in the other chamber to the melting point.

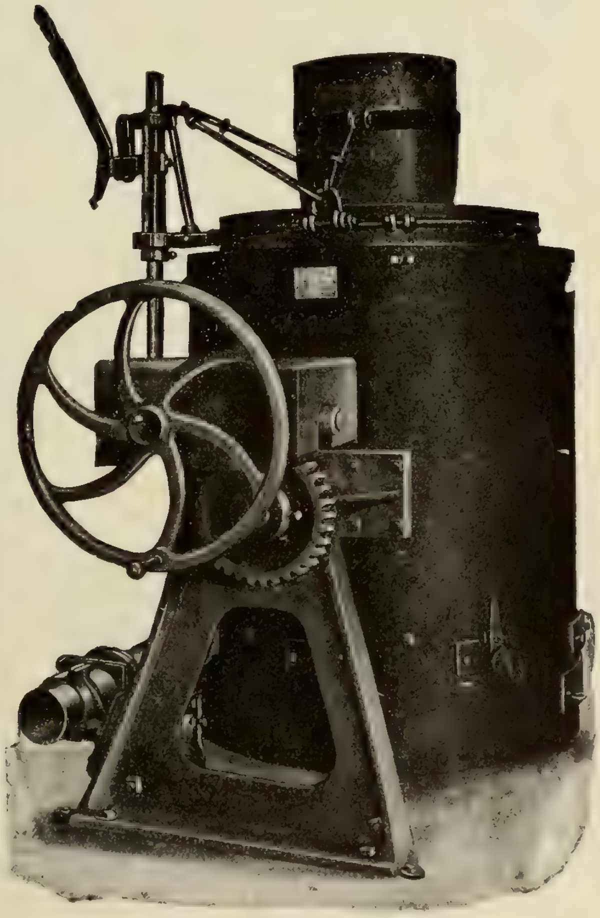
"Monarch Rockwell" Single-Chamber Furnace is built on the same lines as the **Double-Chamber Furnace,** but without its continuous heating capacity. Fastest and best fuel economizer of its kind.

We would like to tell you more about these record-making furnaces. Let us hear from you. Ask for catalog C.F. 3-1918.

The Monarch Engineering & Manufacturing Company

1206 American Bldg., Baltimore, Md., U.S.A.

SHOPS AT CURTIS BAY, MD.



Monarch Coke Crucible Tilting Furnace

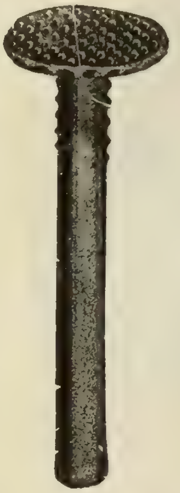
Hopper feed, above ground, shake grates, all size crucibles.

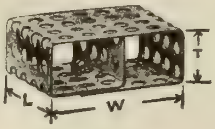
Foundry Chaplets

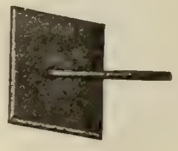
of every description

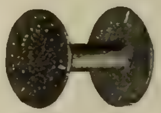
Forged, Riveted or Electric Welded

Let us prove to you the value of Fanner Quality, once tried always used









Hard Iron Tumbling Stars

Made of a Special Grade of Iron for the Tumbling Barrels.

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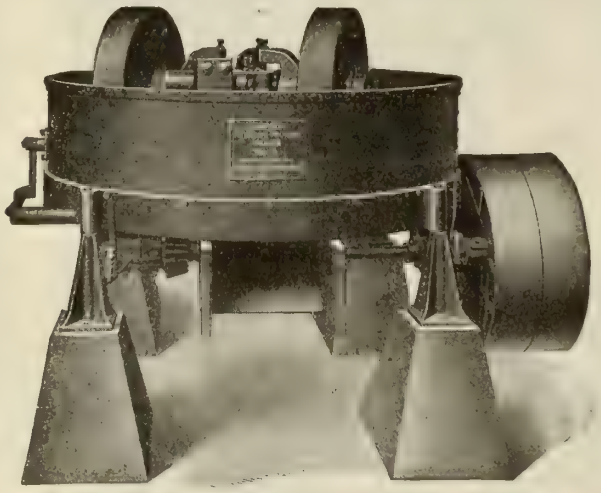

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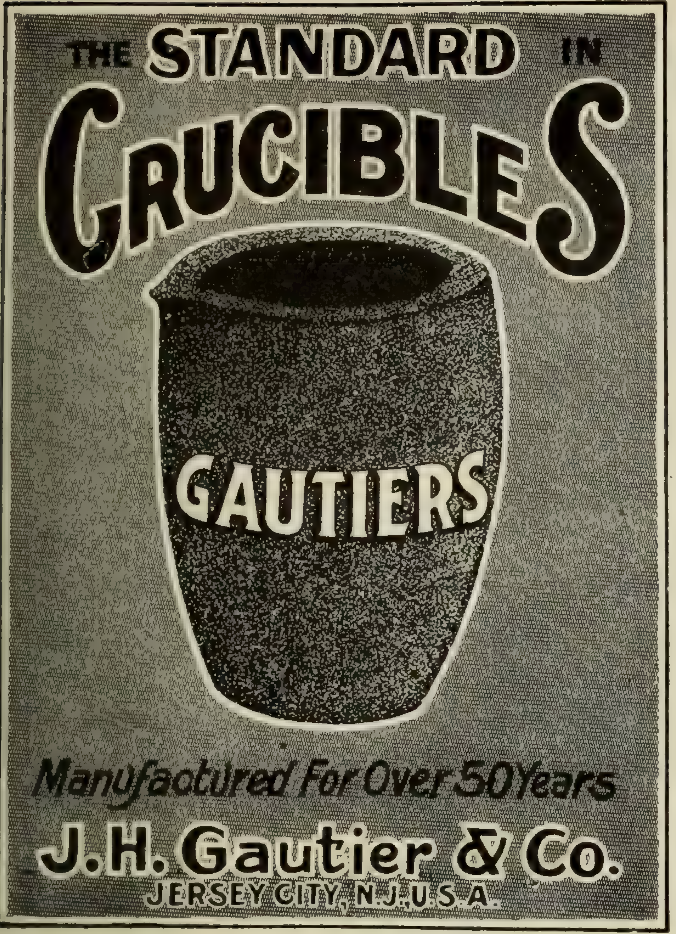

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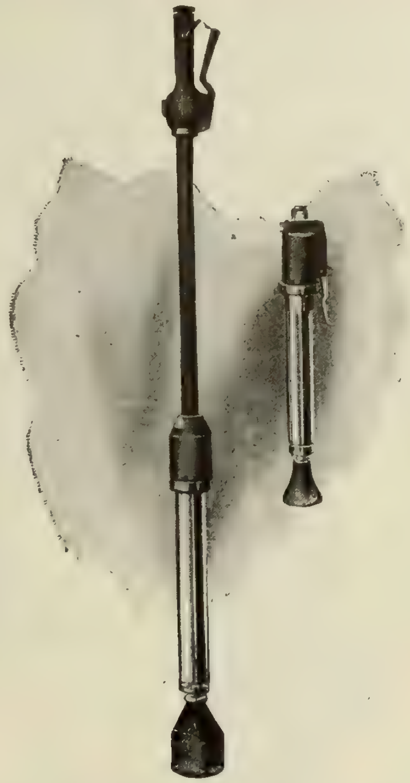

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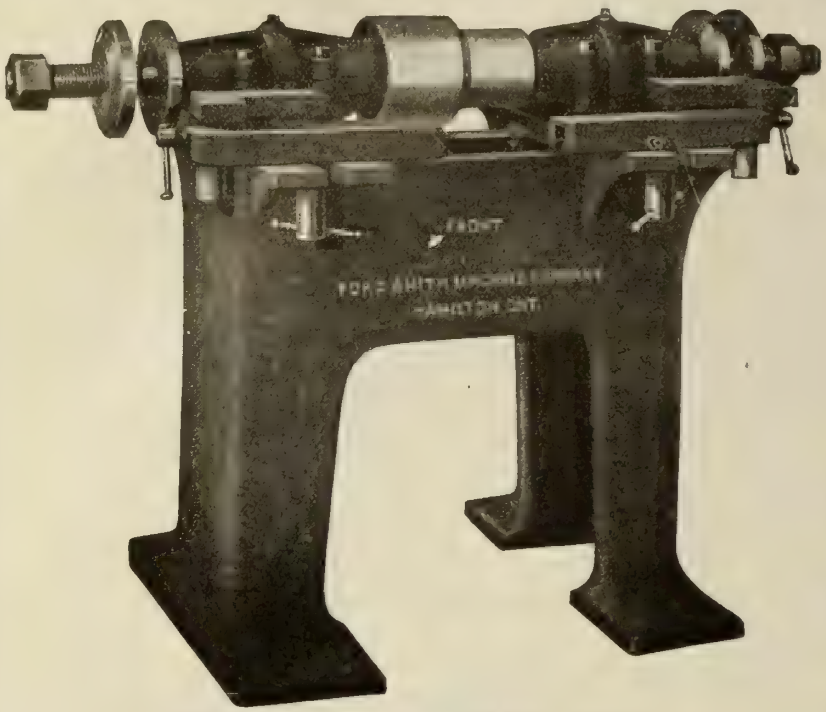

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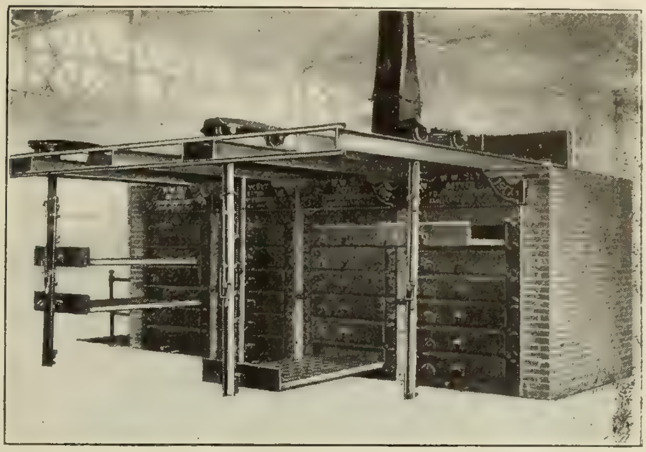

Correct and simple arrangement of flues and dampers permits easy control and even distribution of heat. Cores are thus quickly and thoroughly baked, with a minimum amount of fuel being consumed. Elimination of waste space is another fuel-saving principle of its construction.

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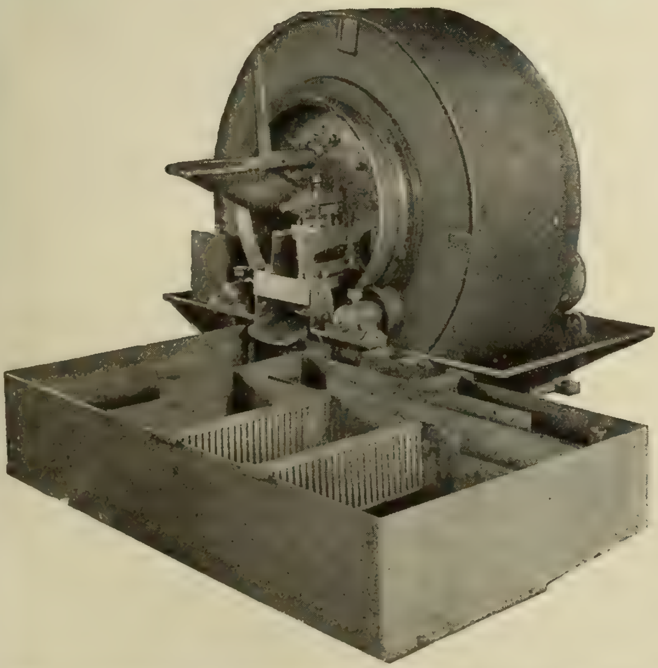

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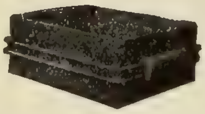

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Heat Treating and Annealing Furnace with Oil Fuel Equipment

Staff Article

Despite the variety of equipment now available for all lines of manufacture, and the degree of perfection attained in the design and production thereof, circumstances occasionally arise where individual requirements influence the production of articles more or less at variance with standard types. The furnace described herewith is an apt example of personal initiative combined with adaptation of stock equipment.

OPPORTUNITIES for obtaining first hand experience in furnaces burning coal, oil and gas, have been particularly numerous since the shell industry came to this country. Previous to that time there were, of course, many plants which employed furnaces on a large scale—steel works, enamelling plants, and specialized factories of various kinds. The great majority of machine shop establishments, however, had their requirements capably met by small and medium sized gas fired furnaces, and in some cases coke fired furnaces were used.

Features of Fuels

The beginning of munitions making resulted in a widespread activity, mostly of an experimental nature at the start, which embraced the three fuels mentioned, and finally resulted, in probably the majority of cases, in the adoption of oil fuel. The less general availability of gas militated against its use except in the larger industrial centres, where its convenience, cleanliness, and the comparatively greater familiarity of most workmen with its operation influenced its frequent adoption. For use on a large scale the cost is sufficiently high to compel consideration being given other fuels.

Coal Displaced

With careful manipulation and suitable furnace construction, anthracite coal has in one particular instance given very satisfactory results but here again the installation was of medium size and under more or less constant operation. Such conditions, however, did not obtain in the case of the plant where the furnace shown in the accompanying illustrations is installed. Previous to recent reconstruction, this furnace was of the old side fired type, using soft coal. The fire chamber extended along the right hand side where the oil burners are now located, giving a long narrow grate, difficult to fire properly, and increasing the width of the furnace by about 50 per cent. over that shown. In addition, a brick stack was carried up through the floor above. The lighting up of such a furnace was never a pleasant proposition. The amount of smoke around the rooom till the draft caught on properly, the length of time heating up to a working temperature and the unavoidable variation in temperature, all combined to render it unsuited for the work on which it was employed by the Radcliff Saw Mfg. Co., of Toronto, and an investigation of numerous oil fired furnaces in the surrounding district convinced them of the merits of that fuel.

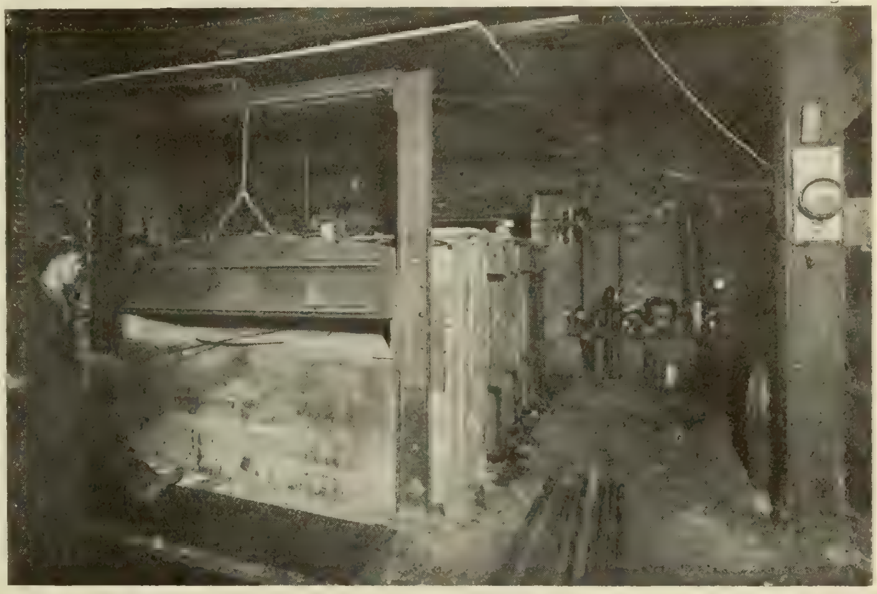

FIG. 1. GENERAL EXTERIOR VIEW OF FURNACE. OIL TANK IN FOREGROUND AND PUMPING EQUIPMENT AT BACK.

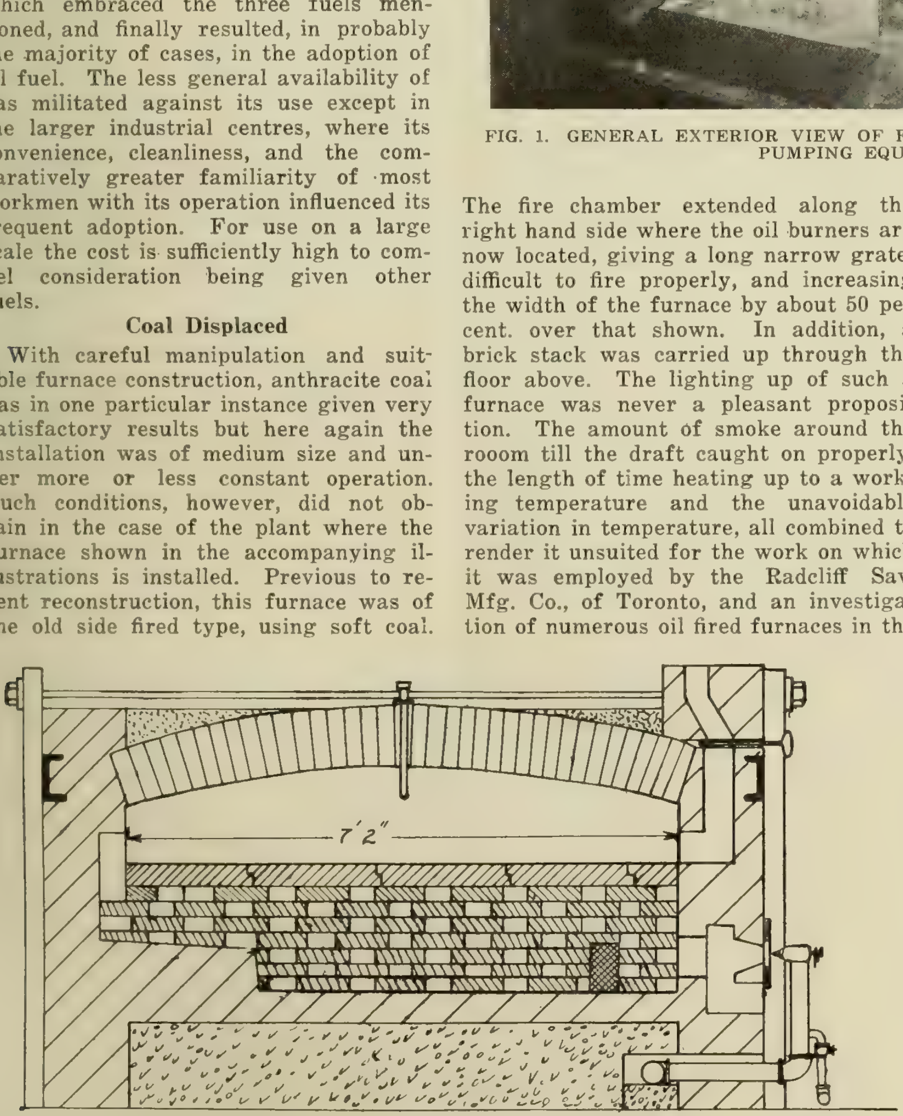

FIG. 2. CROSS SECTION OF FURNACE SHOWING ARRANGEMENT OF BURNER PASSAGE AND BAFFLE BLOCK

Features of Design

While the general principles of oil firing are more or less similar, there are opportunities for the exercise of individual judgment, both in the manner of consuming the fuel and in the arrangement of combustion chamber, baffles and flues which exercise an important influence over the distribution and control of temperature. The design of the furnace proper is the work of the company's superintendent, J. C. Hills, while the fuel burning apparatus is Tate-Jones & Co.'s low pressure system. Owing to cost of materials, etc., the foundation and brick-work were executed by local furnace builders, the burners and pumping equipment being erected by the Radcliff Co.

The general appearance of the exterior is shown in Fig. 1. A cross section is shown in Fig. 2, while Figs. 3, 4 and 5 are respectively a part longitudinal cross section and elevation, sectional view of burner, and view of pumping equipment. The hearth is 7 ft. 2 in. wide by 11 ft. 2 in. long, and is composed of tiles 18 in. by 13 in. by 3 in. laid with their length across the furnace, and supported by eight cross walls. These cross walls are of standard size fire-brick spaced as shown, and a burner set opposite each alternate one so that the flame, after striking on the large renewable baffle brick (shown cross hatched), percolates through the spaces into the adjacent flues and meets the hot gases from the next burner.

Action of Gases

The hot gases thus distributed pass across to the opposite side of the combustion chamber under the influence of the draft from the four flues shown. It will be noticed that the perforations in the cross walls extend into the flue area and thus allow it to draw on the outer cross passages. On ascending into upper or work chamber, the gases flow across the surface of the arch and make their exit by four similar flues in the right hand wall, each flue having a separate passage to atmosphere with individual dampers. See cross section, Fig. 2.

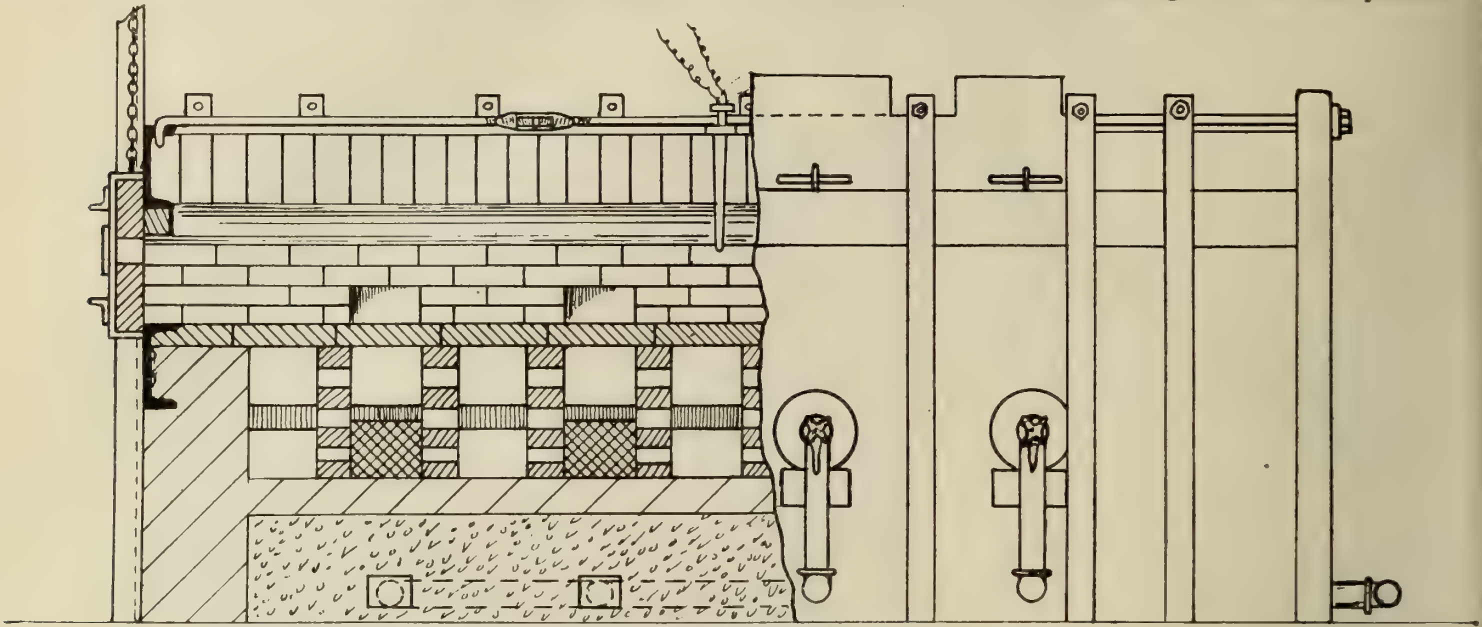

FIG. 3. PART SECTION AND ELEVATION SHOWING PERFORATED SUPPORTING WALLS UNDER HEARTH.

Low-Pressure System

The low-pressure system of burners is so termed because of the small air pressure required for operation. Those installed are Tate-Jones L-1 type, operating with air at approximately 2 lbs. pressure per sq. in., while the fuel is supplied at a pressure of 20 lbs. per sq. in. As shown in sketch Fig. 4, the fuel is supplied through the ⅜ in. pipe which enters the 2 in. air pipe near the ground, and extends upward to an internal nozzle, its exit from which is controlled by a needle valve adjusted by a star wheel.

This internal nozzle is movable bodily to or from the mouth of the burner casing by means of a threaded bushing having a suitable handle, which therefore allows the proportion of air to be increased or diminished without altering the fuel valve setting, the inside fuel pipe readily springing the maximum distance traveled by the bushing in adjusting the air supply.

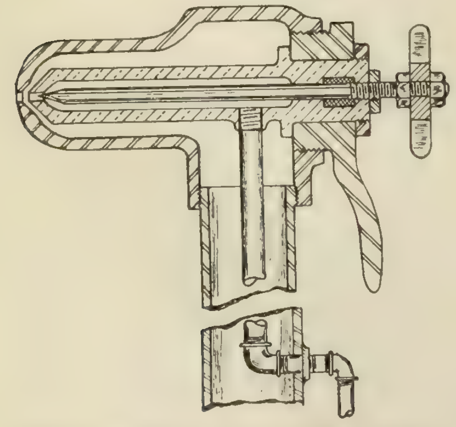

FIG. 4 SECTION OF BURNER SHOWING INTERNAL OIL PIPE AND NEEDLE VAVLE.

Auxiliary Air Supply

The openings in the wall through which the fuel and air pass to the combustion chamber are of enlarged conical section for one-third of the distance, when they are joined by extra air passages from below, so arranged as to surround the ingoing streams of air and oil with an additional body of air, the entire product then passing through the remaining straight third of the wall and impinging on the baffle blocks previously referred to. The resulting combustion is extremely good, the complete atomisation of the fuel being assured, while the auxiliary air flues described reduce the possibility of danger when a flare-back occurs as may happen once in a great while through careless adjustment.

The tendency of the heat to rise gives every chance for the hearth to get well saturated at high temperature and thus prevents undue cooling when the furnace is loaded up; the heating is also correspondingly more rapid. During operation the roof arch is swept by the hotter gases and the resulting radiation of heat down on to the work gives excellent uniformity of temperature throughout.

Individual Dampers

A simple type of slide damper is fitted in each discharge flue and thus permits the heat to be distributed or localized according to the shape and size of work being heated. The combustion gases pass upward to a large hood, Fig. 1, whence they escape to atmosphere through a small steel pipe which replaced the former massive brick shaft.

Toward the back of Fig. 1 is seen the pumping equipment which is remarkable for its compact arrangement. Fig. 5 shows this in more detail. Just below the lower right hand corner the oil storage tank is sunk in the ground, the oil being drawn therefrom and pumped to the fuel burner by a small De Laval rotary pump which maintains a steady pressure of 20 lbs. per sq. in. An overflow relief valve on the discharge side prevents damage or trouble when all of the burners are shut off suddenly. At the far end of the bench is a No. 4 P.H. and F.M. Roots positive pressure blower

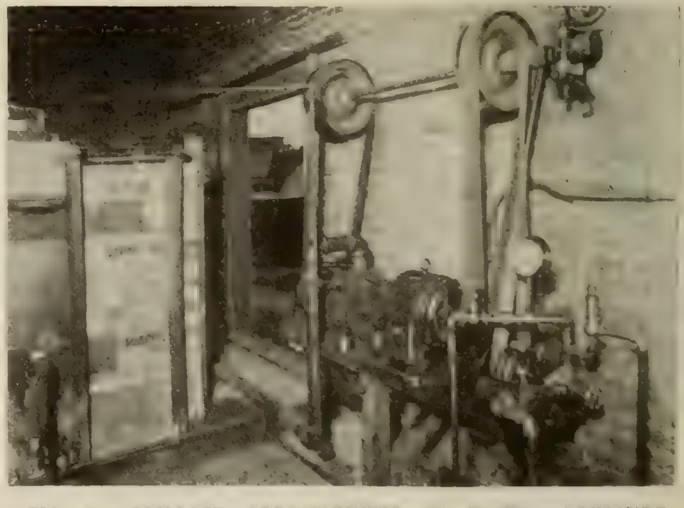

FIG. 5. COMPACT ARRANGEMENT OF MOTOR. PRESSURE BLOWER AND OIL FUEL PUMP FOR FURNACE

supplying air through a 2-in. pipe at 2 lbs. per sq. in. This air pipe is led into a passage formed in the furnace foundation and is thus considerably preheated before mixing with the fuel.

A three-phase 25-cycle Chapman and Walker motor is located between the two pumps, driving them by countershaft as shown.

The work for which the furnace was originally built consists of hardening saws thus necessitating a low wide chamber. The quenching bath is shown in Fig. 1, being 9 ft. by 18 in. by 10 ft. deep sunk in the floor below the operator. Suitable overhead tackle enables the saw to be held vertically and revolved at a proper speed while being quenched. A Taylor Instrument Co's pyrometer outfit reading to 1,800 deg. F., covers the range of all of the work at present. Considerable special work has been done, however, such as heat treating aeroplane axles, several being in the foreground of Fig. 1, while the annealing of special sheet steel stock is handled to great ad-1, while the annealing of special sheet steel stock is handled to great advantage, the fuel system enabling the composition of the gases to be kept free from oxidizing effects on the metal.

◆

ANNUAL CONVENTION OF FOUNDRYMEN'S SOCIETIES

MILWAUKEE, one of the leading foundry centers of the United States, has been selected as the 1918 meeting place for the annual conventions of the American Foundrymen's Association and the American Institute of Metals. Concurrent with these gatherings will be held the exhibition of foundry equipment and supplies, machine tools and accessories. On Monday, Oct. 7, the deliberations of the two foundrymen's technical societies will be opened with a joint session, and at the same time the visitors will be given their first opportunity to inspect the displays. The convention and the exhibition will continue throughout the week.

The meetings of the American Foundrymen's Association and the exhibition will be held in the Auditorium, where ample display space will be afforded and a sufficient number of large meeting rooms are available for the joint sessions which will be scheduled for three days of the week. This commodious building will be the center of all the foundrymen's activities, and here the headquarters will be established for both organizations.

The Auditorium is one of the largest and most complete structures of its kind in the world. Machinery hall, where the operating exhibits will be assembled, has a floor area of 54,000 square feet, and the arena, where the still exhibits will be located, has a floor space of 22,500 square feet. If necessary, the stage, 50 x 68 feet, also may be used for exhibition purposes. Two large meeting halls are located on the first and second floors respectively, and are separated by wide corridors from the exhibition areas, thereby insuring freedom from noise. Milwaukee also has ample hotel facilities to provide accommodations for the 3,000 to 3,500 visitors who attend these affairs.

Milwaukee is one of the largest foundry centers of the United States, and provision will be made for plant visitation in the week. Within the confines of the municipal limits of the city are located about 80 gray iron, steel, malleable iron and brass foundries, and including North and South Milwaukee and West Allis, the total is in excess of 90. Racine, Wis., only a short distance from Milwaukee, is the center of approximately 20 foundries. Milwaukee also is one of the leading steel casting districts of the world. It has approximately 20 steel foundries, a number of which recently have installed small open-hearth and electric furnaces. According to the 1914 statistics the value of iron, steel and heavy machinery of Milwaukee exceeded that of any other of its industries with a total of $34,300,585, and it is estimated that last year this totalled more than $50,000,000.

The committee of the American Foundrymen's Association empowered to decide upon the time and place of the 1918 convention and exhibition, which met in Milwaukee several days last week, consisted of the following: Benj. D. Fuller, president, Westinghouse Electric & Manufacturing Co., Cleveland; C. E. Hoyt, exhibition manager, Chicago; H. R. Atwater, Cleveland, Osborn Mfg. Co., Cleveland; S. T. Johnston, S. Obermayer Co., Chicago; V. E. Minich, Sand Mixing Machine Co., New York, and A. O. Backert, secretary-treasurer, Cleveland.

◆

COPPER IN NORTHERN CANADA

THERE is already evidence of the existence of copper over a large area of Northern Canada according to a recent statement by Prof. Frecheville of the Royal School of Mines.

Specimens or nuggets of native copper were first obtained from the Esquimaux, who used the metal for their implements, and the occurence was subsequently confirmed by the few travellers who have been in that region; and it is interesting and significant to note that the specimens of rock which have been brought from these point to the occurrence being geologically similar to that of the highly-productive and profitable copper mines of the Lake Superior district of the United States. The new copper district referred to is situated east of Great Bear Lake and along the course of the Copper Mine River, which runs north from about latitude 65 deg. into Coronation Gulf in the Arctic Ocean. Evidences of the occurrence of copper are also reported as far east as Bathurst Inlet, and on Victoria Island. There appears to be no doubt as to the above facts, and consequently the present position may be summed up by saying that there may be a great copper field somewhere in that region awaiting development, and that the locality is worthy of being carefully examined and prospected both from a Canadian and from an Imperial point of view.

COPPER CONSUMPTION GREATER THAN OUTPUT

THE consumption of copper last year which passed through the refineries of the United States is estimated to have absorbed all the metal prepared for market in the twelve months and nearly 29,000,000 pounds in addition. That is, the stocks of refined copper held over from 1916, which amounted to about 128,000,000 pounds, were not only not increased during 1917, but were reduced to a level in the neighborhood of 100,000,000 pounds.

The country's refineries produced in 1917 a total of 2,300,000,000 pounds, an increase of 102,600,000 pounds over the output of copper in the preceding year. In 1914 the refinery capacity of the United States was estimated at 1,778,000,000 pounds a year. Since then additional facilities have been created which should enable the refineries to produce 2,780,000,000 pounds a year. The nation is reckoned by experts on copper production to be equipped with means for making copper in quantity sufficient to meet any probable need, provided that the supplies from the smelters are adequate and labor is plentiful. It is the labor problem which refining men say is causing them more anxiety at the present time than any single development since the United States entered the war, because many men are quitting the mines in order to reap higher wages elsewhere.

◆

TRAIL SMELTER OUTPUT

OPERATIONS of the Consolidated Mining and Smelting Co. of Canada, during the year ending September 30, 1917, were significant and not only was the great enterprise at Trail, B.C., a financial success, but satisfactory progress in the matter of development has been made as well.

The main achievement was the production of 10,000 tons of pure zinc of a value of $3,000,000, which event marks a definite stage in the metallurgical history of the country. The production of refined lead was increased by 2,000 tons to 22,000 tons, the production of sulphuric acid was doubled, and a new record was made by the production of $13,000,000 worth of metals.

J. J. Warren, managing director, states that a daily production of over sixty tons of pure zinc was reached during the year, and that an extraction of over 90 per cent. was made from certain classes of ore. Since the process has been standardized every effort is being made to reduce costs, and a concentrating mill with a capacity of 400 tons of ore a day is being operated to treat the Sullivan zinc ores. On the question of profits, the managing director gives the Imperial Munitions Board the reputation of a keen buyer, inasmuch as the Board has required that the company meet the prices current in the United States with a certain allowance for freight charges. The Board, however, has absorbed the bulk of the company's production, the Canadian commercial requirements having slackened very considerably during the war.

ORGANIZED KNOWLEDGE AND NATIONAL WELFARE

By O. C.

THE future of any nation is secure if it lives up to its possibilities and develops to the full its natural resources, which development can be only accomplished through organized knowledge. It is essential to an individual, to a firm and to a nation that its organized knowledge should be kept up to date by constantly increasing and applying this knowledge. To accomplish this, interest in research should be constantly kept up, and much research in all branches of science be kept going. This should be done not only in physics, chemistry and engineering, but also in the biological and mental sciences. Increase in knowledge in the field of biological sciences means more and more better food, improved public health and increased material welfare. Better knowledge of the fundamental principles of the mental sciences means increased efficiency in administration, legislation, education, operation and research.

The research by which organized knowledge is increased will doubtless always be carried on by three distinct types of research organization; research by the government in national laboratories, research by the universities in connection with instruction, and research by industrial laboratories in the interests of manufacturing firms. National research includes such problems as standardization of measurements, guardianship of the public health, and those connected with contagious and vocational diseases. It has to deal with making good roads and increasing the fertility of the soil, as well as with matters merely relating to lessening the cost of production. University research must always be chiefly concerned with the advancement of the various sciences as such, and the development of the fundamental principles of each science. Industrial research takes the middle ground and has already become a distinct profession. Its proper field has to do with the elimination of works troubles and the investigation of fundamental principles. This brings up the question of the ideal research man and ideal research laboratory. A large number of students are really fitted for research work if properly trained along the right lines, and thus might be evolved the ideal investigator, who should have a mind at once fertile and well trained. His mind should be trained to have unerring judgment and to reject ideas which are not logical and promising.

Desirable Training

The best training for a research man is a thorough grounding in the fundamental principles of his science, physics, chemistry, or whatever it may be. If he has this, it is safe to say that in any properly organised research laboratory, under proper leadership, the student will have many more useful ideas than he can himself possibly follow up. Fertility of mind is not so much an inborn quality of the mind itself as of the training and association which that mind has had.

The ideal industrial laboratory consists of two quite distinct divisions, one doing all the works testing and analysis of materials and the other dealing with large fundamental problems, requiring skilled specialists and considerable time for their solution. The alternate plan, having a single research laboratory covering both works troubles and new problems, is not so successful, as the new work is liable to be interrupted whenever a special press of works problems comes in, and is therefore less efficient.

Industrial research is best carried on by team work. Thus two, three or more men work together on the same large problem or group of problems, the aim being to have a good theoretical man, and a good practical man working together as much as possible, or even a physicist and a chemist in some cases. The important point is, however, to have regular conferences of the men working on the problem, say once a week, to discuss it, to plan new work, and to consider the various interpretations and applications of the results obtained.

The conferences may also be attended by a member of the legal department, who will take in hand any ideas worth patenting, and also by a member of the works wing of the research division who will look after the application of any results that have reached a sufficiently completed stage. In this way the specialists are relieved of the responsibility of directing the attention of the works and of the patent department to useful patentable results.

Closer Touch Wanted

It is a crying need, as far as national welfare is concerned, that professors and teachers should be in closer touch with industrial problems. The ideal instructor for a research student is a man who has already carried out research work along industrial lines. It is also necessary that there should be more cooperation amongst the various branches of research—national, university and industrial. When the problem in the research department has been worked out it has then to be transferred to the works, and it is here in applying this knowledge that the engineer takes part in the scheme. It is of as great importance here as for the research man that the engineer should be fully trained and possess a special knowledge of fundamental principles. It is the engineer who, when he experiences troubles in the work, carries back his troubles for the research department to elucidate. He must also possess a knowledge of those fields of work related to his own special field, in order to become more fully competent.

Research is one of the youngest of the professions. It is of vital importance that students who are to follow research should be thoroughly and efficiently trained, and that they should not embark upon it without thorough knowledge of its aims and methods.

WANTED—INITIATIVE ABILITY

By R. Hamilton

INTELLIGENT application of the elementary principles of mathematics and mechanics is not only a factor in the education of the engineering apprentice, but a conscientious study of the theoretical part of his work is essential to the attainment of an end that every young man should strive for. As the "boy is father to the man" so also is the apprentice father to the engineer. No other trade or profession is more exacting than that of the mechanical engineer; the rapid strides and remarkable achievements of science and industry during the past decade has only been possible through the concentrated efforts of those men responsible for its accomplishment. It is true that the dominating feature that characterizes the production of materials at the present time—particularly in metal working establishments—is largely a physical one, but it is equally true that without the modern equipment now in use the efforts of the man would be more or less fruitless.

Developments of machinery, both in the way of improvement and invention, have enabled manufacturing to progress with almost miraculous rapidity, as has been amply demonstrated during the past three years. Present methods of shell production have not been the result of any one man's efforts, or even of any particular class of men, but are rather the evolution of numerous ideas, many of which had their origin in the ordinary practice of pre-war activity. This evolution, and in some respects revolution, of production methods is really due to those men who were mentally responsible for the initial development of those devices, special attachments, and single purpose machines, which have been largely instrumental in the success of the industry.

The efficiency of a plant and the quality of its product are practically dependent upon the efficiency of the individual. The executive possibilities of the organization may count for naught unless the full co-operation of the workmen is given to the solution of the problems that are part of the routine work of every establishment. Every workman, even though in the most humble position, should not only realize his own personal responsibilities, but should seize the opportunities that are constantly open to him to advance his own interests. Trivial and apparently insignificant details should form the basis of developing the initiative of an employee; not only should these details be regularly and conscientiously performed, but they should be studied with the purpose of improving the manner in which they are accomplished, eliminating wherever possible any unnecessary waste of effort. Some may imagine that "it is theirs to do and not to think," this latter being the duty of the man higher up, and while invariably this is the case it is quite obvious that the "boss" did not attain his prominence through the too prevalent spirit of human indifference.

Oxyacetylene Welding and Cutting: Methods and Apparatus*

By Stuart Plumley**

The necessity for preheating castings is pointed out and methods of preheating are described. The design of welding and cutting torches also is considered and the operation of these devices is covered in considerable detail; likewise the necessity for using high-grade welding rods and other supplies is emphasized. Reference is also made to the large amount of welding work done on the machinery of damaged German vessels interned in the States.

IN considering the subject of oxyacetylene welding at prior conventions of the American Foundrymen's Association, attention has been centered largely upon the various classes of work which have been accomplished with the process, and in generally describing the equipment and gases used.

The process has now been employed so many years that practically everyone has a fair idea of it, and generally understands the equipment and the things it will do.

There is, however, an unfortunate condition existing, especially in the New England states, which is brought about by a lack of practical knowledge of the process, and, in particular a lack of knowledge of the metallurgy of iron and steel as it affects a weld. Amng some of the foundries and machine shops in this district, the impression seems to have gained ground that the process produces only a hard, brittle union of the two parts to be welded, and that the weld cannot be machined; also that a weld in cast iron has no particular strength. Nothing could be further from the truth than this impression. It has been brought about by a lack of study of the process, by the use of very poor filling rods, and especially by the use of a great variety of apparatus, with which the market has been flooded which is improperly designed and constructed, and which is directly responsible for failures.

Under these conditions it seems opportune at this convention to consider the process, as applied to foundry work from a more scientific standpoint and with a better understanding of the various features of the apparatus and its use which bring about success in welding. These various factors cannot be given too much consideration. It is upon them that the success of the process in each individual foundry is dependent.

Preheating of Iron Castings

Iron castings should be carefully prepared for welding, and placed in such a manner that preheating may be accomplished without unnecessary handling. This preparation consists in cutting away the edges to be welded to an angle of 45 degrees on each side, to permit the operator to start welding at the bottom of the broken section.

As it is necessary to bring the temperature of the casting up to the point of maximum expansion very slowly and evenly, and as it is desirable to maintain this heat as nearly constant as possible during welding, it is usually best to place the casting in a rough brick enclosure so the heat may be properly confined.

Preheating should be accomplished either with a large oil or gas flame of moderate temperature, or with charcoal. A fuel oil, or kerosene oil burner, is perhaps the most convenient means for preheating. Two such burners operating through openings in the brick wall above mentioned will usually heat a casting evenly, without overheating any particular part.

During welding, these preheating burners may be shut off, if the heat is found to be too great for the operator, and, when the weld has been finished, they may be relighted and the casting again brought up to an even heat. It should then be completely covered with asbestos, heated slacked lime, hot ashes, or sand, and allowed to cool very slowly.

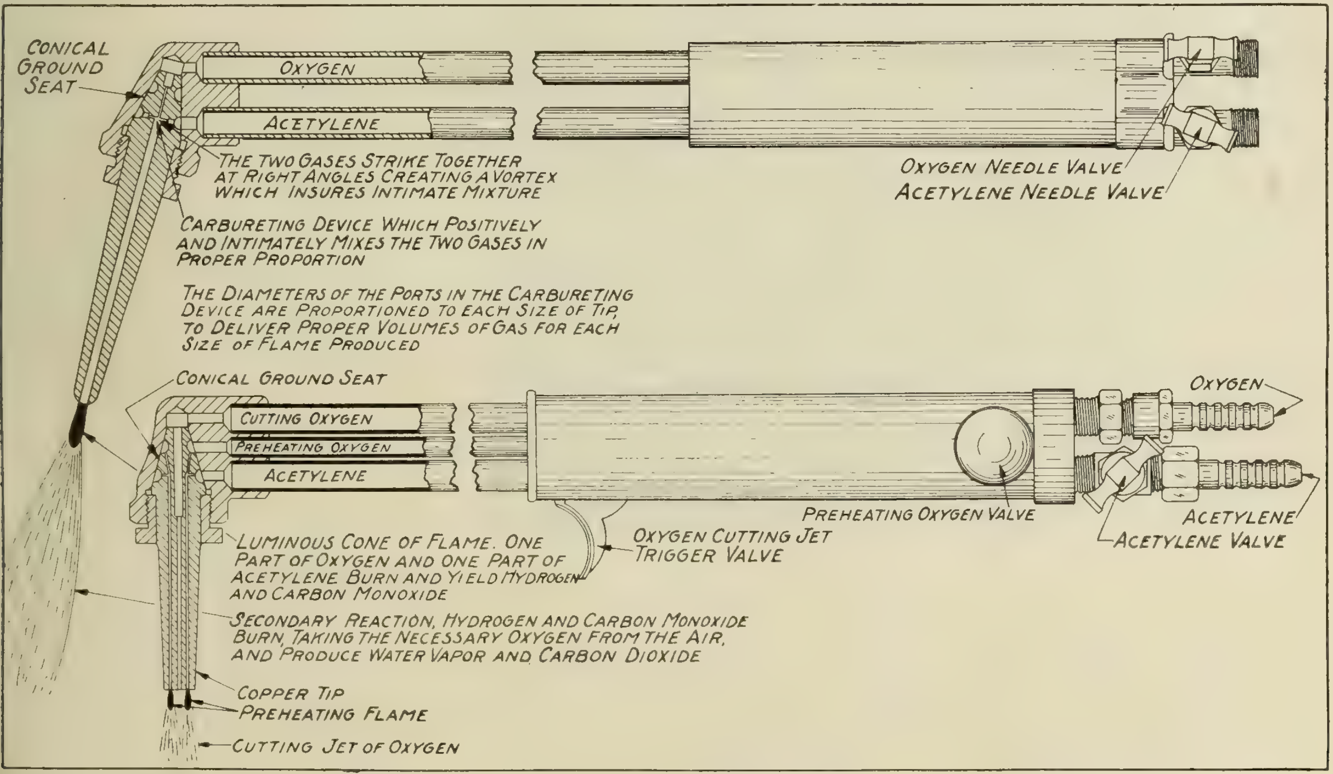
CONICAL GROUND SEAT
OXYGEN
ACETYLENE
THE TWO GASES STRIKE TOGETHER AT RIGHT ANGLES CREATING A VORTEX WHICH INSURES INTIMATE MIXTURE
OXYGEN NEEDLE VALVE
ACETYLENE NEEDLE VALVE
CARBURETING DEVICE WHICH POSITIVELY AND INTIMATELY MIXES THE TWO GASES IN PROPER PROPORTION
THE DIAMETERS OF THE PORTS IN THE CARBURETING DEVICE ARE PROPORTIONED TO EACH SIZE OF TIP, TO DELIVER PROPER VOLUMES OF GAS FOR EACH SIZE OF FLAME PRODUCED
CONICAL GROUND SEAT
CUTTING OXYGEN
PREHEATING OXYGEN
ACETYLENE
OXYGEN
PREHEATING OXYGEN VALVE
ACETYLENE
ACETYLENE VALVE
LUMINOUS CONE OF FLAME. ONE PART OF OXYGEN AND ONE PART OF ACETYLENE BURN AND YIELD HYDROGEN AND CARBON MONOXIDE
OXYGEN CUTTING JET TRIGGER VALVE
SECONDARY REACTION, HYDROGEN AND CARBON MONOXIDE BURN, TAKING THE NECESSARY OXYGEN FROM THE AIR, AND PRODUCE WATER VAPOR AND CARBON DIOXIDE
COPPER TIP
PREHEATING FLAME
CUTTING JET OF OXYGEN

FIG. 1. UPPER: GENERAL ARRANGEMENT OF A PROPERLY CONSTRUCTED WELDING TORCH. FIG. 2. LOWER: GENERAL ARRANGEMENT OF A PROPERLY CONSTRUCTED CUTTING TORCH.

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*Paper presented before the American Foundrymen's Association at Boston, Sept., 1917.

**Of the Davis-Bournonville Co., Boston, Mass.

course, necessary that these pressures be each independent of the other, else the proportion would be out of control.

Properly Constructed Torch

Fig. 1 illustrates a torch constructed upon these principles. The oxygen is led to the cast head of the torch through the upper tube under a pressure definitely controlled by the oxygen regulator. The acetylene is led to the cast head of the torch through the lower tube, the pressure being controlled by the acetylene regulator.

The interchangeable tips fit into the receptacle provided in the cast head of the torch by means of a ground joint, and each tip is arranged to produce a different size of flame for use upon different thicknesses of metal. In order that this may be accomplished, the size of the longitudinal bore through the tip and the diameters of the oxygen and acetylene ports must be in proper proportion so that at the pressures given by the regulators the right amount of each gas will pass through these ports. There is one oxygen port and two or more acetylene ports, the oxygen port being vertical and the acetylene ports horizontal. These ports meet at right angles at the upper end of the longitudinal bore through the tip. The streams of unlike gases, consequently, enter this longitudinal bore under high velocity and strike together, creating the vertex we have already described.

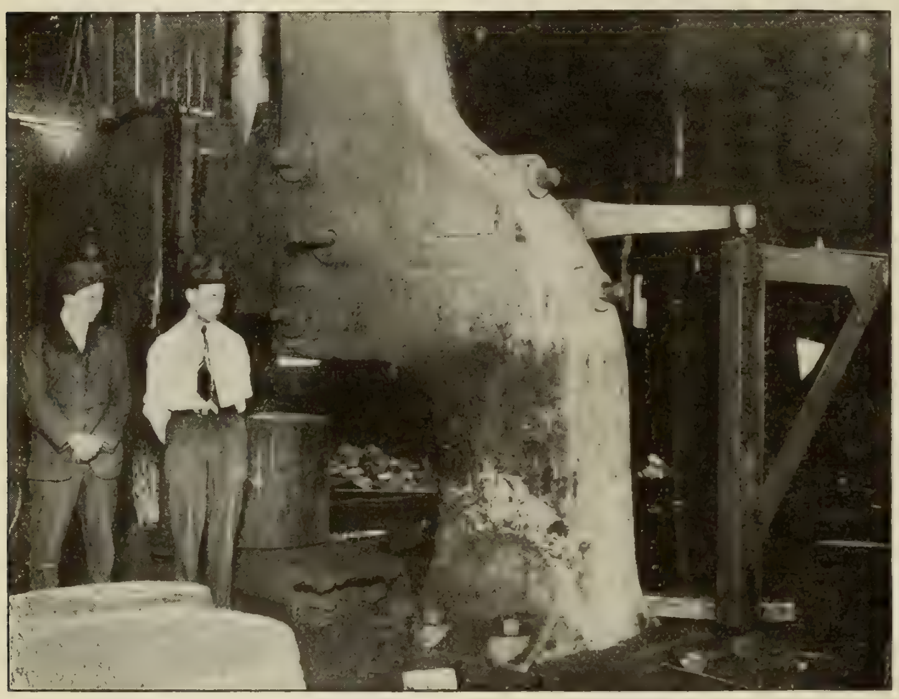

FIG. 4. A MORE DETAILED VIEW OF THE WELDED LEG.

Fig. 1 clearly shows the luminous cone of flame produced and also the secondary reaction, or enveloping flame which surrounds the weld. The torch is held by the operator in such matter that the luminous cone of flame barely touches, or is a short distance away from the metal which is being welded. It will be very readily understood that if there is an excess of oxygen passing out of the luminous cone unconsumed, it will come in contact with the molten metal, which is being welded and cannot help but produce an oxidizing effect. This renders the weld much weaker than if complete combustion were attained.

It will, therefore, be appreciated that the design and construction of the torch is a very vital factor in the success of the process, and that a positively neutral flame must be secured. Many operators do not appreciate these facts and pay little or no attention to the character of the flame, and this results in failure which unfortunately cannot always be detected until the weld is placed under a strain.

A little thought on this subject will make it apparent that the two gases must be under a constant pressure to maintain the neutrality of the flame, and that this constant pressure is dependent upon the regulators attached to the sources of supply of oxygen and acetylene. It is, therefore, essential that both regulators be so designed and constructed that these pressures will be steady and even.

Welding Supplies and Materials

In welding cast iron, aside from the importance of preheating and of thorough and proper mixture of the gases in the torch, there is another factor upon which the whole success of the weld is dependent. In making a cast-iron weld, whether the defect is a sandhole or a crack, the metal adjacent the break or hole must be chipped, or v'd, until the included angle between the faces of the break is 90 degrees. After the casting has been properly preheated and the torch applied, the sides of the break are melted away with the torch, and this entire opening slowly filled with cast iron fused into it by melting welding rods held by the operator. The operator ordinarily uses the cast iron rod as a puddling stick, with which he is able to work out slag, blowholes, etc.

The strength of the weld is dependent upon the composition of the welding rod used. It is a well-known fact that silicon in cast iron tends to promote the formation of graphite making the iron soft. Managanese and sulphur, on the other hand, have just the opposite effect. Cast-iron rods, therefore, should be high in silicon, and the grade of iron used in their manufacture must be of the very best. The rod must be cast in a heated metal mold in such manner that it is free from sand and is not chilled on the surface.

In New England, there are a great many cast-iron welding rods upon the market which contain very little silicon and are high in manganese and sulphur. They are also of a poor grade of iron of course are sold at a low price. The use of such welding rods tends to produce white or chilled iron, containing no graphitic carbon, making the weld intensely hard. The use of proper welding rods increases the amount of silicon in the weld, and decreases the manganese and sulphur, enabling the operator to produce a soft weld, which may be machined without trouble. It would, perhaps, surprise a good many people to know how many jobbing machine shops in Boston will turn down an iron casting if the machining upon it involves the machining of a welded part. Much of this trouble lies in the use of the cheaper grades of welding rods. Even some of the larger companies, who depend entirely upon purchasing agents to buy supplies, price being the only consideration, experience identically the same difficulty, because the welder is utterly unable to produce a satisfactory weld with a poor welding rod.

The manufacture of good welding rods cannot be carried out in an ordinary foundry, as the iron is not suitable for the purpose. The production of such rods is the work of a special foundry, properly equipped, and with accurate knowledge of the requirements.

A good scaling powder is, also, essential in making a cast iron weld. Melted cast iron has a great affinity for oxygen, which combines with it to form an oxide of iron, or slag. The oxide is lighter than the melted metal and does not melt at quite so low a temperature. As it rises to the surface, a great deal of it can be removed by scraping it away with the welding rod. The object of a flux in this connection is to provide a chemical which at the high temperature involved will break up the oxide into its component parts. Two chemicals in the flux combine with the oxygen in the slag, releasing the iron, and allow the oxygen to pass off in the form of carbon monoxide, or carbon dioxide.

When the torch is first applied to cast iron and the metal becomes fused, the molten metal from the two pieces to be welded will not run or melt together on account of the film of oxide covering

This slow cooling tends to prevent the carbon in the iron from taking the form of combined carbon, which renders the casting hard and brittle.

There are two objects in preheating. The first is to bring the temperature of the casting up to the point where welding may be accomplished with an inexpensive fuel and with a flame or flames which are large enough to heat a large part of or the whole casting. In this way a good deal of expense is saved, because almost any fuel, like kerosene, fuel oil, or charcoal, costs considerably less and does the work better than oxygen and acetylene. In some instances where the castings are large it would be impossible to bring the casting up to a welding heat with the oxy-acetylene torch alone. Second, kerosene or fuel oil torches, or charcoal are used to heat the casting prior to welding so as to expand it, so it will not crack or be strained on cooling. Such preheating is always necessary where the casting is complicated or where there are several members, in which the movement of expansion and contraction would be restricted. If these members are not expanded, either in part or whole, before welding contraction, after the weld has been accomplished, will set up strains in some of the members, eventually, if not immediately, causing a break.

Care must always be taken, however, in preheating a casting to see that it is not heated so hot it will be warped out of shape. This is especially the case where there are machined surfaces, which must be kept true. Preheating should always be accomplished very slowly so that sudden temperature changes and stresses will not be produced. Slow heating is essential especially when the casting is a combination of thin and heavy parts. Cooling in all instances, as stated above, should be accomplished as slowly as possible.

In the first instance, where the casting is large and heavy and has been heated merely to save gas, the temperature to which this preheating may be carried makes very little difference, because this temperature will not ultimately affect the utility of the casting. If desired, it may be heated to a dull red heat. In the second instance, where the casting is complicated, or where there are machined surfaces, which must not be warped out of shape, the temperature of preheating must not be anything like as high as a dull red, but, on the other hand, it must be sufficient to expand the metal properly so that, when contraction takes place, it will not create a strain or break.

Definite rules for preheating are practically out of the question because in each instance individual conditions govern the method.

Proper Mixture of the Gases in the Torch

In order to produce a proper weld in iron and steel, it is essential that the torch be so constructed that it delivers the two gases, oxygen and acetylene, in proper proportions, and that it thoroughly and intimately mixes these gases.

In every oxy-acetylene torch, the two gases are brought together in some manner, the object being to produce a luminous cone of flame at the tip of the torch. If there is just enough acetylene, thoroughly mixed with the right quantity of oxygen, to produce complete combustion there will be, in the first reaction of the flame, no unconsumed oxygen or acetylene coming in contact with the weld, and the flame will produce very satisfactory results. But if there is an excess of oxygen, which cannot be consumed in the first reaction of the flame, this excess of oxygen of necessity plays upon the heated metal during the welding operation; and hence oxidizes or burns the metal. If there is an excess of acetylene instead of oxygen, the effect will, perhaps, be less harmful, but the increased amount of carbon which will be taken up by the metal tends to make the weld hard and brittle.

Before proceeding further with this discussion, it may be well to explain that in the oxy-acetylene torch we are consuming oxygen and essentially gaseous carbon. Acetylene contains approximately 93 per cent. carbon, the remainder being hydrogen, with exception of a few impurities, which need not be given consideration.

There are two definite stages of combustion in the oxy-acetylene flame; one is termed the luminous cone of flame. In this stage of combustion theoretically one part of oxygen and one part of acetylene burn, and yield hydrogen and carbonmonoxide. In the secondary reaction, which is usually called the enveloping flame, or the envelope, hydrogen and carbonmonoxide burn, taking the necessary oxygen from the air and produce water vapor and carbon dioxide. This secondary reaction forms an envelope of burning non-oxidizing gases, which practically surrounds the heated metal during the welding operation and prevents its absorption of oxygen from the air.

It is this enveloping flame and the complete combustion of the oxygen and acetylene delivered by a properly designed welding torch that makes it possible to produce efficient welds.

Gases Will not Mix

The opinion seems to have become more or less prevalent in New England, with which the writer is specially familiar, that it is only necessary to lead the two gases together and to control them with two regulating valves in order to produce the required neutral flame. But, a great deal of experience has shown that this is not a fact. The two gases will not mix together intimately when brought into contact and passed through a channel. There must be some other means for mixing them and some definite way to deliver the gases in proper proportion. This is accomplished in properly designed torches by leading the gases through very small ports of proper diameter, so that the velocity in each instance is high. These ports are arranged at right angles to deliver the jets of gas in fast flowing streams, which strike together and produce a vortex.

In this manner the two gases are thoroughly and intimately mixed before they pass through the tip to the first stage of combustion. They are also mixed in as nearly the proportion of one to one as is practicable under working conditions, this proportion being determined by the diameter of the ports leading the gases together and the pressures at which they are delivered. It is, of

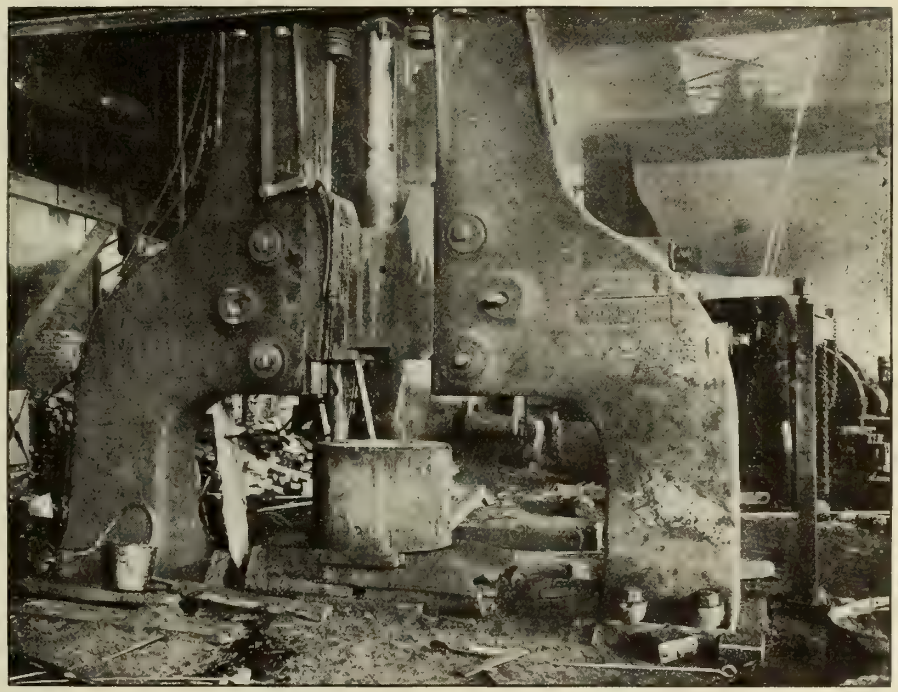

FIG. 3. LARGE STEAM HAMMER WITH WELDED LEG.

each mass. The application of a small quantity of flux renders the surface of the metal clear and mirror like, and under such conditions the two masses of metal will quickly flow together in conjunction with the melted welding rod.

If, in the various foundries where cast-iron welding is being accomplished, the foreman in charge of the department would give more attention to the grade of cast iron rod he is using, his department would be far more successful in producing proper welds. It requires, as a rule, but a few cents worth of welding rods to complete a weld, and the value of an expensive casting may be dependent absolutely upon the strength of the material used. Therefore, a proper rod cannot be considered from a standpoint of price. The best grade of rod obtainable is by far the least expensive.

It is not the purpose in this paper to attempt to refer to or illustrate the many very important pieces of work which have been accomplished by the oxy-acetylene welding process. We are illustrating, however, a particularly interesting piece of work recently completed in Chicago.

Figs. 3, 4, 5 and 6 are reproductions of photographs of a steam hammer, the cast-iron leg of which was broken completely off. The break occurred on a Tuesday morning. On Tuesday afternoon preparation of the casting began. It was necessary to clip, or "v", the break clear around the leg. Welding was started on the following Friday and completed on Saturday night. The hammer was assembled Monday morning and put in operation the following Wednesday morning. It has been working day and night, since the break was repaired.

In all, the repair required 16 linear feet of welding in cast iron ranging from 2 to 3 inches in thickness; 2,000 cubic feet of oxygen and about 1,800 cubic feet of acetylene were consumed. The welding required the services of four men, each relieving the other.

Fig. 6 shows the leg lying flat on the floor of the shop, the break having been enclosed in a rough brick furnace. In this manner the heat was confined, and the temperature maintained to a very even degree. Preheating was accomplished with large fuel-oil burners. The job is interesting, because it will be readily appreciated that the tensile strength of the weld must, in this instance, have been sufficient to stand up under the very severe strain to which a machine of this type is subjected.

There are many, many other instances of similar work, but in the majority of them, where the castings are large and heavy, the principles of operation remain the same. Care and skill, good apparatus, and suitable welding supplies are required to make such work successful. The skill, however, is not beyond the intelligence of the average operator, and such skill can be attained without serious difficulty under proper conditions of instruction.

A very interesting application of the process on cast-iron was the welding of the broken cylinders of two of the interned German steamship which were recently taken over by United States government, and repaired at a certain navy yard. These cylinders were badly broken. In many instances pieces had been entirely removed from them and disposed of. In such instances, it was necessary to recast new parts the shape of the broken ones and weld these new parts into place.

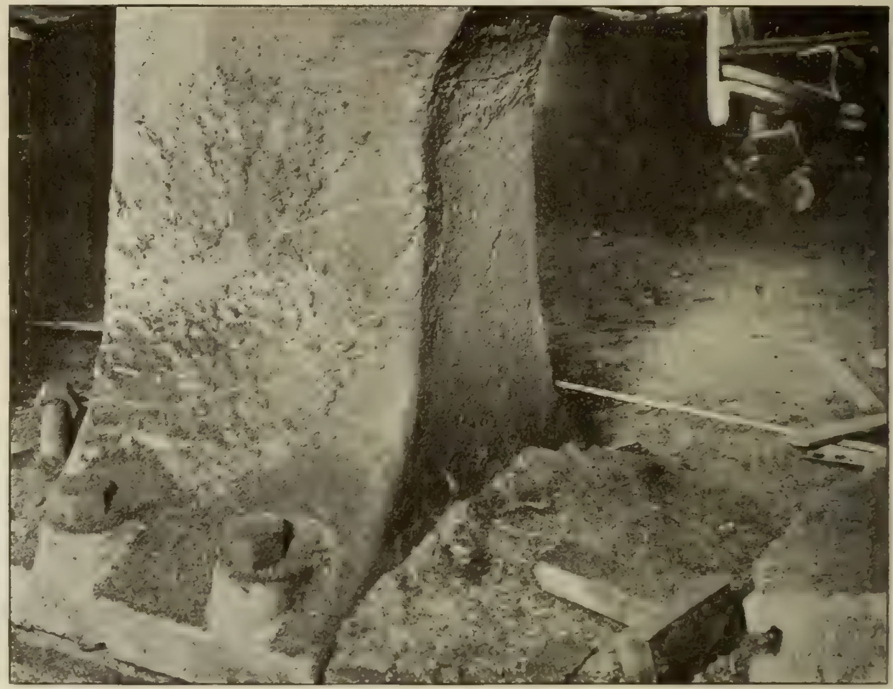

FIG. 5. CLOSE-UP VIEW IMMEDIATELY AFTER COMPLETION.

Perhaps, the only way the extent of the welding accomplished on these vessels may be appreciated, would be the consideration of the following list of breaks which were repaired:

First Vessel.

Welding crack about 19½ inches long in starboard low pressure cylinder liner.

Welding crack about 27½ inches long in port low pressure cylinder liner.

Welding four broken places each about 8 inches long on end of liners, two on port low pressure cylinder, one on port second intermediate pressure cylinder, and one on starboard second intermediate pressure cylinder.

Welding crack about 12 inches long in cylinder liner of starboard second intermediate pressure cylinder.

Welding about 33 inches on port high pressure cylinder.

Building up about 18 inches on patch on port first intermediate pressure cylinder.

Welding patch about 53 inches on port first intermediate pressure cylinder.

Welding patch about 46 inches on port second intermediate pressure cylinder.

Welding patch about 73 inches on starboard low pressure cylinder.

Welding patch about 73 inches on starboard second intermediate pressure cylinder.

Welding patch about 80 inches on port low pressure cylinder.

Second Vessel.

Welding two broken places on flange of elbow about 9 x 3 inches.

Welding flange about 57 x 4 inches on starboard intermediate pressure cylinder.

Welding slide valve of steam chest 9 x 4 inches on starboard intermediate pressure cylinder.

Welding crack about 12 inches in bushing of starboard second intermediate pressure cylinder.

Welding two pieces on end of flange about 13 x 5 inches on starboard second intermediate pressure cylinder.

Welding patch about 8 x 6 inches on cylinder liner, starboard second intermediate pressure cylinder.

Welding patch about 32 inches in starboard second intermediate pressure cylinder.

Welding patch about 32 inches in starboard high pressure cylinder.

Welding flange about 39 inches on starboard high pressure cylinder.

Welding piece about 7 inches long in steam chest, valve of cylinder liner, starboard second intermediate pressure cylinder.

Welding patch about 54 inches on port second intermediate pressure cylinder.

Welding flange about 36 inches on port second intermediate pressure cylinder.

Welding flange about 48 inches on port high pressure cylinder.

This work was all accomplished between June 21 and July 23, approximately one month. It is difficult to believe that it could have been accomplished with any other process or by mechanical means.

Similar work was attempted with the electric arc, but did not prove as successful as with the oxy-acetylene torch. The use of the electric arc, as applied at other navy yards to similar work, necessitated a steel casting, the shape of the broken part, as the arc does not produce satisfactory results in connection with cast iron. The new cast-steel part was attached to the main body of the cast iron cylinder through the use of steel spuds screwed into the casting and set as close together as possible. It will be appreciated that such a joint would be partly a mechanical joint, and partly a welded joint, and could not be expected to be as efficient as a joint which was welded throughout.

As the oxy-acetylene torch is especially adapted to welding cast iron, the welding of these cylinders became largely a matter of proper preheating to take care of expansion and contraction. The weld possessed ample tensile strength, and the results were very satisfactory. All the cylinders were carefully tested under rigorous conditions and stood up under severe requirements.

It would be very interesting to show photographs of these broken and welded cylinders, which were taken at the time, but the necessary permission from the government has not been obtained. It is needless to say that repairs to the two German vessels in question have been made with much greater rapidity and at much less expense than if it had been necessary to replace the broken cylinders and parts with entirely new castings.

Cutting in the Steel Foundry

The cutting process is now generally understood by the great majority of foundrymen. It is, of course, not applicable to the iron foundry, but is exceedingly useful in the cutting risers in the steel foundry.

Cast iron cannot be cut with the oxy-acetylene torch, but cast steel is quickly and easily cut at a very reasonable cost. It is so much more convenient to take the torch to the castings than to transport a heavy casting to the saws and strap it into position for sawing. Without doubt the cost of sawing a riser is less than the cost of cutting it with the oxy-acetylene torch, unless consideration is given to the time required to place the casting at the saw, and the much greater length of time required for sawing. When all factors are considered, including the output of the foundry, a cutting torch is found to be not only an economy but an actual necessity, and to-day there are very few steel foundries in the country where one or more cutting torches are not in continual operation.

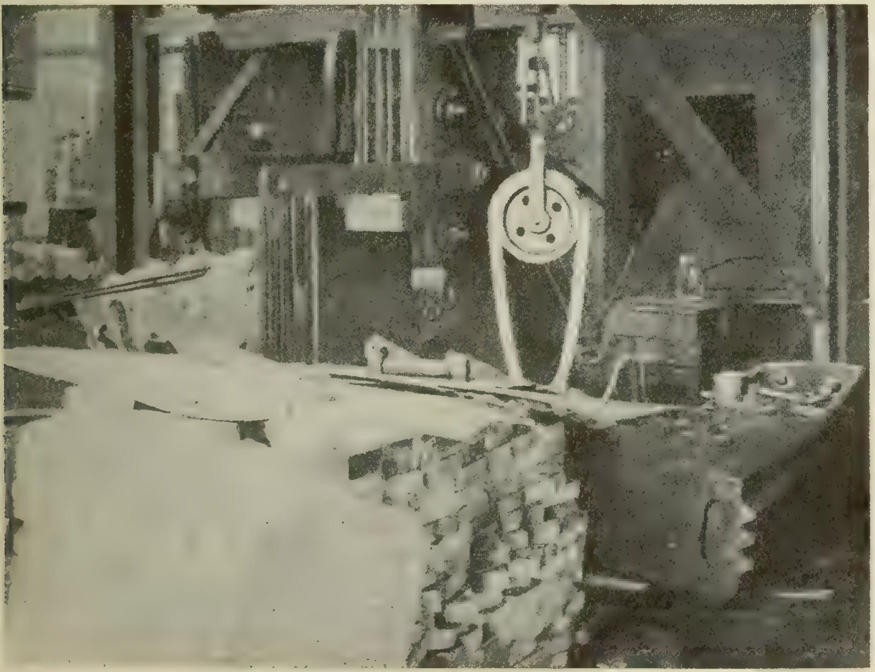

FIG. 6. PREHEATING LEG WITH ROUGH BRICK FURNACE TO RETAIN HEAT.

In connection with cutting, as in welding, it is essential that the torch be properly designed and constructed in order to do the greatest amount of cutting with the lowest possible consumption of oxygen and acetylene. A properly constructed torch is illustrated in Fig. 2. As in the welding torches, the two gases are led together through very small ports, under high velocity, but as cutting is an oxidizing process, it is not necessary that the preheating flames be absolutely neutral in character, as is essential to good welding. It is, however, necessary that the gases be applied and the tip of the torch so arranged that the torch will cut cleanly and efficiently any thickness of riser to which it may be applied. This is accomplished with the torch shown in Fig. 2 through the use of interchangeable tips, which are furnished in many different styles, each style suitable for the class of work in view. For light and intermediate cutting, the greatest economy is obtained through the use of two preheating flames; for heavy cutting, where a good deal of sand is encountered, it is sometimes desirable to use four, or more, preheating flames.

In all probability, cutting apparatus gets harder usage in steel foundries than in other shops, partly due to the class of labor generally operating the torch and partly to the prevalence of sand in the riser, which causes the oxide to continually flare back. For this reason, to produce successful results and give efficient service, a cutting torch must be very substantially constructed. In general, cutting is far easier than welding and can be mastered by a man of very ordinary intelligence in a short time.

Conclusion

The oxy-acetylene process in the past 12 years has made progress, which can scarcely be appreciated unless one is thoroughly familiar with each step as it has been developed. Perhaps, this progress is best expressed in terms of oxygen, as the consumption of oxygen is indicative of the use of both welding and cutting apparatus. It is safe to say that 12 years ago there was practically no oxygen consumed in this country, either for welding or cutting. To-day a rough estimate of the volume of oxygen consumed in connection with the process is between 40,000,000 and 50,000,000 cubic feet each month.

This development has been so rapid, however, that sufficient consideration could not be given to the proper instruction of skilled operators. In the past most men who have learned to weld or cut have done so despite the difficulties which they encountered and under conditions which did not produce the most successful results. It is without doubt appreciated that to-day there is more urgent necessity for skilled operators than for development along other lines. This need is being met by the establishment of welding schools where complete courses of instruction are given. The foundryman of to-day can profit most in connection with the process if he will give careful attention to the kind of instruction given his operators. Even in the case of a skilled welder, a few weeks in a welding school will bring out methods of operation with which he is not familiar, and will teach a great deal which will be new and useful. His efficiency and the efficiency of the process is largely dependent upon his own knowledge and skill in connection with his trade.

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95 PER CENT. OF VETERANS FIT FOR FORMER WORK

CONTRARY to the general impression created by the emphasis which is laid to-day on the awful mutilations of the present day warfare, the great majority of the soldiers returned to Canada unfit for further military service and discharged have been able to return to their old occupations and carry on in civil life. In fact the number who must be educated in a new line of work represent only 5 per cent of those who have come back, according to the figures of the vocational training fyles in the Military Hospitals Commission headquarters.

A few men unsettled by the irregularity of military life want to switch to some new line of work, but the average man, detained in the convalescent hospitals in Canada for further medical treatment, is anxious to get back to his old job.

Back To The Old Job

"What are you going to do when you are discharged?" one middle-aged man was asked.

"Do?" he echoed. "I'm going to do what any sane man of my age would do. I'm going straight back to work. This is just marking time in one's life, like having to go to a wedding on one's busiest mail day. I'm not going to exploit the war as a means of getting a living, or emigrate, or do any fool thing like that. I am going straight back to my office, I am. I know exactly where I turned down the page of my sales book when I came out—it was page 79—and I'm going to start again on page 80."

WEIGHING APPARATUS IN THE FOUNDRY

By C. T.

THE correct and systematic weighing of foundry materials is of the utmost importance if good castings are to be produced with economy and despatch. In the modern foundry the bulk material, both iron and coke, is carefully analysed before purchasing, and also periodically analysed at the factory to ensure that the quality is being maintained. The laboratory apparatus is generally of the best quality, and it is just as important that the various grades of metal should be correctly weighed before being put into the cupola, otherwise the castings will not give the desired analysis.

Shop Conditions

The conditions which obtain vary considerably in different foundries, depending on the layout of the plant and the nature of the castings to be produced. In most cases it is the practice to have a small stock of material comprising the charges on the cupola platform, although sometimes these stocks are kept on the ground level, the charges being automatically elevated and discharged into the cupola mouth. Probably the most important machine in the whole foundry is that which weighs the various materials comprising the charge. It is, therefore, of the utmost importance that the weighing apparatus at this point should be the best of its kind and the most suitable for the work. The type of machine used is generally of the dormant pattern, of heavy construction, the platform being of sufficient size to accommodate the wheelbarrows or bogies, and the indicating arm of the no-loose-weight type. To enable continuous records to be kept a tape or ticket-recording device may be fitted.

Special Type

A special machine has been produced for weighing and recording charges which has been widely adopted for blast furnace work. It is not so generally used in ordinary foundry practice, although it is eminently suitable for the work. The apparatus consists of a series of say, six steelyards, three or four steelyards being used for the various grades of pig, one for scrap, one for coke and sometimes one for lime. The steelyards are totally enclosed in a lock-up, the various weights not necessarily being known by the barrowman. The charge hand or other administrative person sets the poises to the various weights of each grade, etc., required. A small trigger outside the case enables the operator to put into use the steelyard corresponding to the nature of the material which is on the weighing platform. The triggers are either numbered or otherwise suitably inscribed to denote the material, the correct weight of which has been set by the poise on the steelyard.

Individual or cumulative weights may be put on the platform—that is to say, the total constituents comprising the charge may be weighed collectively or individually; of course, each constituent must be on the platform separately. To increase the speed of operation and ensure accuracy a pointer, which has a plus and minus range, is sometimes fitted. This enables the operator to see when the correct load is being approached. Also a recording device may be fitted which records the exact weight of each charge, whether correct or in excess or deficiency. This machine is a distinct advance in the weighing of furnace charges, and if properly used and maintained helps to insure reliable castings.

It is not generally desired to weigh the molten metal in the ladles, but machines have been supplied of the suspended pattern, having clock-face dial indicating automatically the weight of the metal as it is poured into the ladle. On these machines special guards have to be fitted to protect the mechanism from the heat of the metal.

Weighing Finished Product

The weighing of the finished castings may be done on either a truck weighbridge or portable or dormant platform machine, the type of machine used depending entirely on the class of work turned out; the truck machine being used for heavier castings, the dormant machine for castings of medium weight, and the portable machine for light castings. These machines should be fitted with no-loose-weight steelyard, or preferably with tape or ticket recording system steelyards, so that accurate record may be kept of output. A platform or dormant machine should also be provided for weighing the gates, spills and bad castings. This should be placed near the cupola.

The sand is generally weighed in bulk, but it is sometimes desired to apportion the day's requirements. In this case a dormant machine fitted with rails to suit the bogies may be installed.

All the weighing apparatus in use in foundries should be of the heavy type; the bearings, knife edges, etc., protected as far as possible from sand and dirt and dust. The weighing apparatus which is often used in foundries is generally unsatisfactory, the type of machine being unsuitable for the work. They are generally kept in a dirty condition, the parts being clogged with sand particles, so that the resultant weighings are inaccurate, the management thereby not being able to obtain a reliable output and melt loss figures.

Before installing any kind of weighing apparatus in the foundry individual manufacturers should be consulted, for they will bring their expert knowledge to bear on the subject and supply the most suitable apparatus for the purpose. The weighing machines in the foundry, especially, should be maintained in condition by the manufacturer, who usually sends his own skilled men frequently to the satisfactory foundry cost figures.

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EYE HAZARDS IN INDUSTRIAL OCCUPATIONS

A NEW book written by Gordon L. Berry, Field Secretary, National Committee for the Prevention of Blindness, with the co-operation of Lieut. Thomas P. Bradshaw, U.S. Army, formerly Technical Assistant to the Director of the American Museum of Safety, octavo, 150 pages, fully illustrated. Published by the National Committee for the Prevention of Blindness, 130 East 22nd Street, New York. Price, 50 cents.

In this volume the author reviews the chief industrial hazards to eyesight in the industries of the United States. Case reports illustrate each section, the special dangers are described and recommendations made for such changes of working conditions, or installations of protective devices, as have been found suitable for protecting workers. The book is most completely illustrated.

The following section headings indicate the scope of the book: Statistics of eye accidents, chipping operations, machine operations, abrasive wheels, sand-blasting, "mushroomed" tools, riveting, radiations from intense light and heat sources, ultraviolet rays in illuminants, radiant energy in arc welding and in molten metal, metallurgic operations, glassblowers' cataract, infections, gauge glasses, acids and chemicals, treatment of acid burns, industrial poisons, removal of dangerous fumes, vapors and gases, spray process hazards, methyl alcohol, bottling accidents, mining and quarrying, agricultural hazards, goggles, garment trade hazards, industrial lighting, the safety movement.

These subjects have been treated not so much in the way of a technical manual for safety engineers, but rather in a general informative way for the information of the average manufacturer or layman who is seeking information of this nature. Descriptions of many of these hazards have been included heretofore in publications covering the complete field of industrial accident prevention, and where discussion of preventive measures would be repetition, the author has referred his reader to the chief of those sources where such detailed information might be secured, if desired.

The book is the most complete compilation of material relating solely to the prevention of eye accidents that has been published in this country. Inasmuch as there occur annually in the United States alone nearly 200,000 eye accidents, from which many cases of total blindness result, it would seem that there is need for further attention to this important subject.

◆

THERE are, at the present time, 32 Heroult electric furnaces in Canada and 22 of other types—in all 54 furnaces using the electric process. These furnaces have a capacity of 173,000 tons of iron and steel, 50,000 tons of ferrosilicon and 8,000 tons of other ferroalloys per annum. The British Forgings plant at Toronto has 10 electric furnaces of the Heroult type and a total capacity of about 72,000 tons per annum, making it the largest electric process steel plant in the world.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

EFFICIENCY AND CHEAP PATTERNS

By D. Street.

EFFICIENCY in pattern shops, which is the key to cheap production, depends upon number and condition of machines, the organizing ability of the foreman, the initiative of the craftsman, and the quality of the timber used in the construction of the work. All pattern shops, however small they be, ought to have a saw, a band saw, a trimmer, a sand papering disc, a lathe and a grindstone. The idea that because a shop has only a few men no machines can be afforded is wrong. It is because the patternmaker has realized this truth that he can turn out work cheaper than many firms. It is often possible for the power in a large works to be on all the time, because there is always one or other of the machines in use, but in a small works it is essential that the power be cut off when no machinery is in use. It is possible for an ingenious foreman to improvise adjustments which will make the machines more serviceable, such as glueing a sheet of sandpaper on a lathe surface and making a small table to fix into the ordinary tee-rest.

Ill Treatment of Machines

Machines are more abused in the pattern shop than in any other shop. Carelessness is often the cause, but it is not always possible to foresee the exact finished shape, with the result that the saw "finds" screws and nails. It is cheaper, if need be, to change the saws several times a day than work with blunt saws, which latter practice necessitates much bench finishing and probably spoilt work. A common cause of spoilt work is a slack band saw; a tight band saw is subject to greater strain, and is more easily broken, but the danger of a slack band saw uncutting is very great. A very useful machine is a set of emery wheels for grinding gouges. They must be kept in good condition. If they are not, the outside edge of a true running grindstone is better. A soft stone carefully attended to is a sine qua non of the pattern shop; without it tools cannot be kept in good order, and good tools are necessary for good work.

Wood Lathe Features

Much time is often wasted in turning work; the lathe ought to be provided with several chucks and face plates of different sizes and rests suitable for concave and convex surfaces. The slide rest is occasionally useful in a wood-turning lathe for long straight barrels, but generally it is not of much use. If a workman has to turn a concave surface with a straight rest he has to be either continually stopping the lathe to move the point of the rest nearer to the work, or he takes the risk, which is a considerable one, of the tool dipping, and probably breaking, if there is the slightest vibration owing to the overhanging of the tool when turning at the centre of the rest.

In shops where there is much turning it ought to be done by one man. Turning work is more expensive than it ought to be, because only a specialist can acquire a high degree of dexterity in the lathe. A patternmaker is a better pattern turner than a professional wood turner, because the latter is not accustomed to working to accurate sizes. It is an essential to have a man do the turning for the whole shop as it is for one man to be told off for a patternmaking machine. As little work ought to be turned as possible. The sandpapering disc can do much of the work that was formerly done in the lathe.

Division of Labor

There is not enough division of labor in the majority of pattern shops. Some jobs are peculiarly suited to boys. It is waste to have a highly skilled man making prints and flanges or building segmental work. Prints ought to be stocked in various thicknesses and sizes, and the youngest apprentices ought to make them. It is obvious, if an apprentice builds a segmental body, and a specialist turns it, the finished price is much lower than if one man made it throughout.

The kind and quality of the timber used has a considerable bearing on the finished cost of patterns. For general patternmaking yellow pine is the best timber. It is easily worked and, besides not warping readily, takes a good finish. Cypress and spruce are sometimes used, but are never satisfactory. The former warps, and is too brittle, and it takes more time to shape than yellow pine. Spruce is too open-grained, and changes its shape too readily. It is false economy to provide a bad quality timber to the pattern shops. Apart from the large proportion that is scrapped, cheap timber takes longer to work up. A foreman ought to consider it an important part of his duty to see that when men are breaking out timber they do not cut to waste. Carelessness or lack of skill in drawing off is responsible for this.

Re Setting Down

Too much time is usually spent in setting down work. Unless the drawing board is to be sent to the foundry, the metal need not be painted in. Three or four views are sometimes set down, when only one is necessary. It is often possible, indeed, to make a pattern direct from the blueprint without setting down. It is advisable when doing this, if there is a core box, to prepare it, first drawing the shape of the pattern as well as the core on the joint, when it can be used for taking sizes for the pattern. There is one important advantage of setting down work, and this is that the craftsman sees it full size, and thus it is easier for him to decide on the methods of construction he will adopt.

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MOULDING A CURVED FLANGE

Question.—A. M., Toronto, writes: "Please give me particulars as to how the pattern should be made for a casting as per sketch below also state if casting could be made without a pattern so that the curved flange would make a good fit without machining?"

Answer.—If you follow the instructions set forth you will have no difficulty in producing what is wanted. It will be necessary to lay out a full size cross-

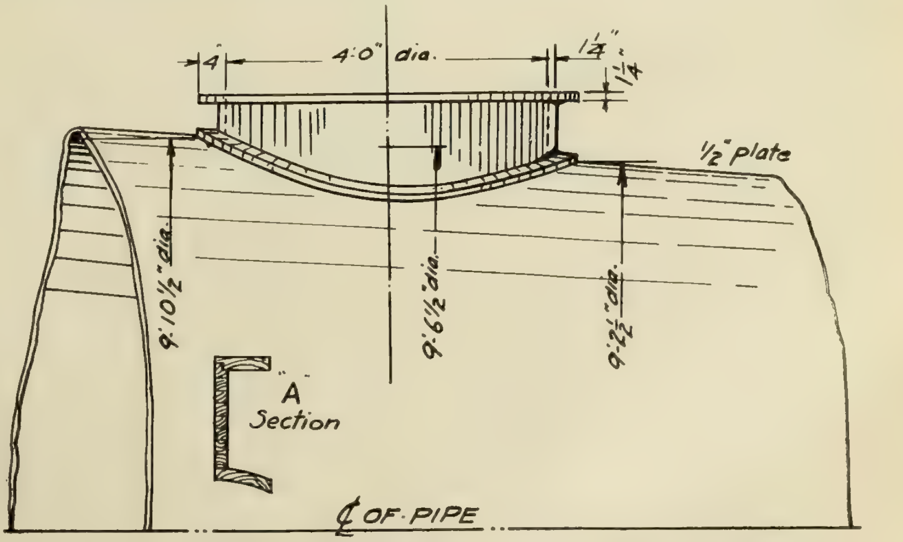

FIG. 1. SHOWING GENERAL OUTLINE OF CASTING.

section to get the deepest part of the casting; this will be through the center, using dia. 9 ft. 6½ in. Build up the cylindrical portion of the pattern, using eight segments to each layer, and if nails are used to hold the segments they must be withdrawn when the glue sets, otherwise you would be unable to cut this part to fit the curved flange without spoiling a few tools.

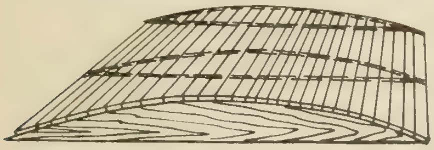

FIG. 2. FORM FOR CURVED FLANGE

The thickest part of this ring will be next the curved flange and at the thin edge you will turn a check to fit the top flange, which must not be fastened to the ring, see Fig. 1A.

To make the bottom flange it will be necessary to build a form accurately to the shape of that part of the pipe which the casting must fit, see Fig. 2.

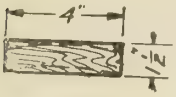

FIG. 3.

Cut three pieces of board to the radii given on drawing, allowing say ¾ in. for lagging, scribe out the size of flange on this and then proceed to build the flange in the following manner: Rip some stock to a convenient width for working, i.e., 4" wide and 1½" thick (see Fig. 3), then fit and joint them on the form. Fig. 4 is a plan showing how flange should be jointed up.

Now that the bottom flange is jointed up, take the center ring and set it on top of the flange in its correct position and secure it so that it will not rock, then scribe the ring from the shape of the curved flange and mark both ring and flange so that they will be put together in the same position. After making sure that the ring is fitted to the flange, glue and fasten ring and flange together, then remove form and trim flange to correct dimensions. Now reinforce with nails and screws where necessary and see that the top flange lifts off freely.

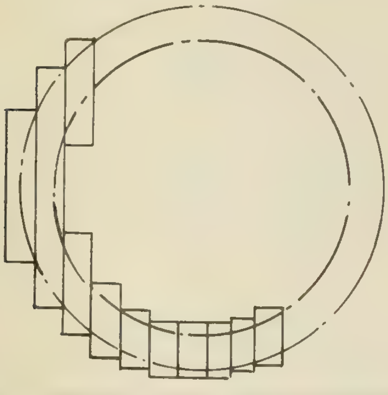

FIG. 1. METHOD OF BUILDING UP FLANGE

If it be desired to make this casting without a pattern, a first-class moulder and a pattern maker with some knowledge of loam work will be required. We will take two diameters at an equal distance from the centre of the casting, say 30 inches each way, and take two boards, A and B, Fig. 5, of convenient length and width and of one-inch stock, and cut one to each radius so that when bedded in the sand at 60 in. apart they will form a guide for sweeping up the face of the curved flange; a center line should be marked on each piece for the convenience of the moulder.

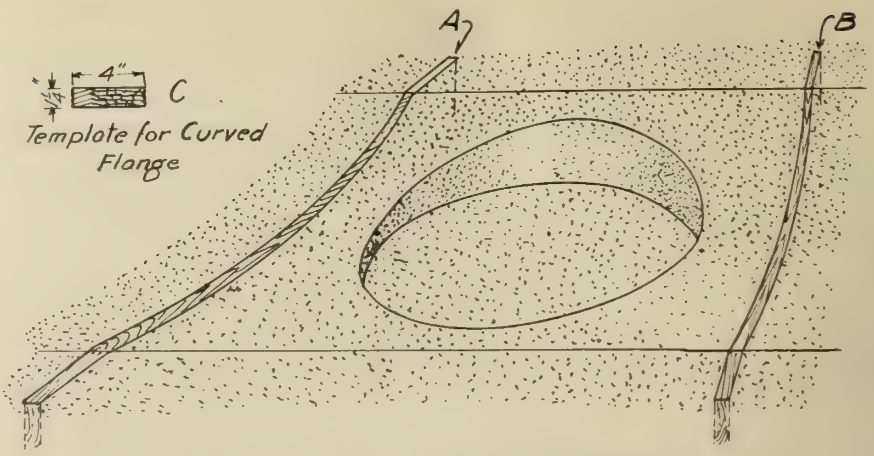

FIG. 5. SHOWING MOLD SWEPT UP READY FOR FORMING THE COPE.

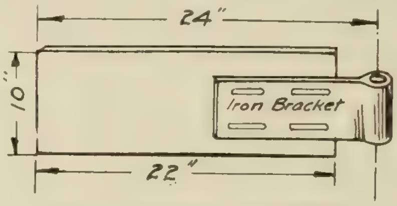

FIG. 7. DETAIL OF SWEEP

The sweep, shown in Fig. 7, is used for striking the inside core of the casting, and is made of a piece of ¾ in. pine, beveled on outside and bottom edges and perfectly parallel, so that the top edge can be used for levelling. The iron bracket is a foundry tool, and the pattern maker should ascertain the size and type used before making the sweeps. The illustration, Fig. 5, shows the two boards bedded in the sand and the inside swept out ready to ram up the top half of the mould. After the cope has been lifted the sweep A is brought into use, this time it is made 1¼ in. longer and cuts 1¼ in. off the inside wall of the mould. Now we will use the piece of straight flange, Fig. 8, and work it all round until the circle is completed. The curved flange will have to be carefully cut with the trowel and a small gauge used to determine the width and depth. It is not advisable to make such a casting without a pattern except when absolutely necessary, and when only one or two castings are required.

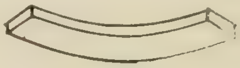

FIG. 8.

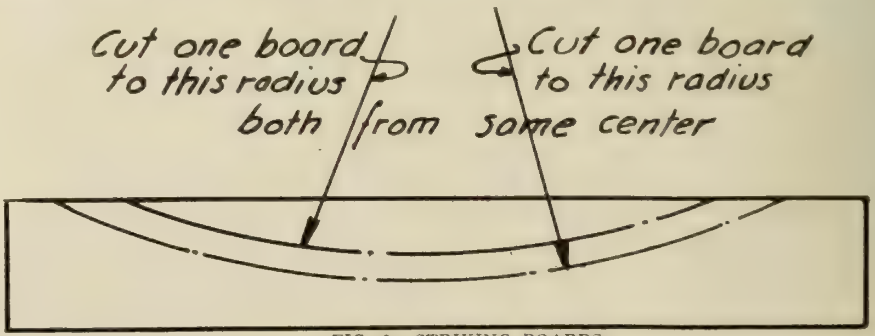

FIG. 6. STRIKING BOARDS.

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IRON FOUNDING WITH A BLAST FURNACE

MANY owners of brass foundries have at times felt the need of iron castings, and quite possibly have desired them in a hurry.

All the equipment necessary for the production of small castings in iron is found in the average brass foundry.

Gray iron of the better kind melts at 2,327 degrees Fahrenheit, and while this may look to the brass founder to be a high heat compared with the yellow brass or composition metal he regularly melts, the casting of gray iron in his graphite crucible is not given a second thought. The melting of gray iron in a graphite crucible is so simple that it is surprising that the practice is not more general.

Alternate layers of charcoal and gray iron, broken to pieces about the size of walnuts or larger (if it is not convenient to have pieces so small), are put in a Dixon graphite crucible, and the melting is done in the pit brass furnace, and an iron casting of high grade will be secured in a very little longer time than it takes to make a brass casting.

By using the bottom of an old brass crucible as a cover the sulphur fumes and coal are kept out of the crucible and the charge is melted more quickly.

Push Yourself Upward in Position and Pay

By John C. Kirkwood

Every man his own salesman—The shame of remaining poor—Most men can double their pay—Examples of self-selling—To get more, sell more—Paying dearly for the privilege of being a leaner—Are you your godmother's beloved child? It's all up to you.

EVERY right-minded man wants to get on in the world—to get higher up and to get higher pay. But not every man with the desire to get on is trying to get on. Many are in a state of semi-repose, waiting for someone, or some force without themselves, to promote them. Because of their lack of initiative, many good men lag behind and remain poor.

No Virtue in Being Poor

Let it be said straightway that there is no virtue in being poor, or lowly-placed, but that, on other hand, there may be discredit and disgrace in being poor and lowly-placed. Many a man earning no more than "the scale" or the market price for the particular kind of service rendered by him should be earning twice as much as he is now getting; and he can earn double his present wage if he has the grit and purpose to multiply his wage by two. The great obstacle in the way of the advancement of many wage-earners in position and pay is a certain contentment with their wages and positions—a contentment that robs them of initiative and ambition.

Leaning on Broken Reeds

Go into any place where men earn wages—so much pay for so much service—and ask each man what he is doing to get on—to get higher up and to get more pay; and the great majority will say, "I'm trying to do my work just as well as I know how. I hope that my employers will perceive my fidelity and the good quality of my work; and that they'll promote me and advance my pay."

You will get an answer like this from common laborers, from skilled artisans, from clerical workers, from executives, from managers, from salesmen, from teachers and professors, from chemists and engineers, from journalists and editors—in short, from all classes of employees.

These men seem to have been taught—perhaps self-taught—that fidelity, ability and first-class performance will, unaided, send them upward and forward. The truth is that while fidelity, ability and superior performance are the bases of advancement, promotion should get its impulse from the employee himself. In other words, if a man wants to get ahead, he should push himself ahead. Failure to get ahead is very often explained by absence of self-pushing.

Doing More Than a Day's Work

If a man wants to get ahead, in pay and position, he must do more than just perform his day's work well. He must, at the same time, be preparing himself for a job higher up—getting ready in advance, by special study. The man who is studying for a job higher up, with the higher pay that usually goes with a higher grade or quality of service, usually possesses purpose. Purpose and Push begin with the same letter. Indeed, if you look at the words relating to advancement, they all seem to be "P" words:—

Purpose
Push
Progress
Promotion
Power
Perseverance
Punch
Preparation
Persistency
Pertinacity
Polish
Publicity
Prod
Practice
Principles
Pep
Performance
Personality
Proficiency
Prosperity
Promptness
Pluck
Popularity
Perception

Failures omit from their vocabulary many of the "P" words listed above—purpose, push, preparation, power. They seem to prefer words beginning with "L":—

Leisure
Laziness
Listlessness
Limpness
Looseness
Lagging
Leaning
Laxity
Loitering
Languor
Lounging
Lateness
Lackadaisical
Lukewarmness

You, the reader of these words, can get some index to the quality of your own life by answering honestly this question—Am I a "P" man or an "L" man?

I.

WHAT are the chances of getting on for an artisan—a machinist, or moulder, or shipwright, for example?

Or to put it more broadly: What are the chances of getting on of the wage-earner—the man who gets so much an hour, or day, or week, or month?

Or to put it more broadly still: What are the chances of getting on for employed men—men who sell their skill, or fidelity, or knowledge, or ability to perform technical or semi-technical work, including professional men such as engineers, teachers, chemists, and so on?

Getting the Right Idea

The chances of getting on, in pay and position, of any class of worker, can be made very certain—almost certain—if the worker himself (1) gets the right idea and (2) has the grit to follow the right idea in the direction of its beckoning.

The right idea is: Every man must sell himself, by the exercise of his own initiative, to those who will pay him his worth; and he must keep on in this selfsame selling effort.

You ask, How can a man sell himself? What do you mean by "selling himself?" Let us answer these questions with suggestive illustrations.

A printer—a compositor—went to his employer with a new floor arrangement of composing frames, imposing table, galley racks, linotype positions, paper-cutting machine, presses, and so on; an arrangement that meant less waste motion, much saved time, and greater output at no increased cost. For his initiative and because of the indubitable value of his suggestions, this compositor was promoted to a higher position, with higher pay. This compositor sold himself to his own employer—sold an idea of his own thinking and observation. He did not wait for promotion, but speeded its coming by an effort of his own.

A Carpenter Has a Bright Idea

A carpenter showed his employers—a wood-working firm—how they could utilize much waste wood for the making of small wooden toys. For this suggestion, representing, as it did, a new source of revenue, and ultimately a new and highly profitable department, this carpenter was promoted in position and pay. In other words he sold something—an idea, a new business—to his employers.

A grocer's clerk showed his employer how he could find a new and extensive customer out of whom much extra profit could be made. He suggested that his employer should open a restaurant at a location where a restaurant was greatly needed. The grocer took up the suggestion, and found himself selling bread, biscuits, canned vegetables, tea, coffee, cheese, fruits, pickles, rice, potatoes, and a score of other grocery lines at higher-than-store prices, and always for cash. The grocer's clerk making the suggestion was given an interest in the new undertaking, and improved his income very substantially. That is, an employed one sold something of his own—an idea—to a buyer of it, and was well paid for his merchandise.

He Sold Himself to Himself

A machinist took up a correspondence course in draughtsmanship, in order to lift himself into a higher grade of occupation, with higher pay. When fully prepared, he applied for a position advertised, got it, and improved his grade of employment. While a draughtsman, he prepared himself as an electrical engineer, taking evening work in an institute of technology; and finally its examinations. To-day he is a consulting engineer, obtaining high fees. The machinist became possessed of marketable wares which brought in a higher rate of pay than the sum per hour he received as a machinist. In other words, he sold himself—his ability and training—in a better market; and he continued to sell his wares—his ability and training, which he steadily improved—in still higher markets.

A teacher in a High School took post-graduate work at Harvard, secured his degree of Doctor of Philosophy, and in the course of a few years of directed purpose became a University professor at a higher annual remuneration than he could ever hope for as a High School teacher. At the same time, he increased himself in prestige, and shortened his working year from September-June to October-May. This teacher, by preparation, guided by purpose, and by the exercise of initiative, sold his wares—superior learning—in a better market.

A manager, on salary, wanting and needing more money, conceived the idea of a central buying agency for a number of retailers. He took his idea to an astute business man and sold it to him along with his own services. To-day that manager is making five times what he formerly made, and owns a substantial interest in the business he originated.

The men who get ahead in this world are those who lift themselves to higher positions, who acquire fitness for higher positions in advance of seeking and occupying them. Most of us are willing to take higher positions and higher pay, promising ourselves, if we get higher positions and pay, by favor more than desert, to qualify for the higher post and pay **afterward**.. Promotion lags for the unprepared, and rightly so. Men that won't move forward beforehand are not likely to carry into higher posts a progressive spirit.

II.

THE message of this contribution to CANADIAN FOUNDRYMAN is addressed in particular to those who are not making progress in their business, their position or their pay. If you are worth more money than you are now receiving, it is a burden upon your own shoulders to get the money you are worth. It is for you to seek more money, some place, on your initiative. In other words, you must sell yourself to some buyer who will give you a better price for what you have to sell than you are now getting. Perhaps—probably—this buyer is your present employer.

If you are not worth more money than you are now getting, and yet desire more money or advancement, it is clearly up to you to make yourself worth more money. In other words, you must have more to sell—more skill, knowledge, productive, executive, or managerial ability. Having more to sell, you are in a favorable position to demand more money or recognition, or both.

III.

IT has been said that there are two classes of people in the world—leaners and lifters; and the leaners are in overwhelming majority. These leaners want to be carried; want their way to be made easy for them; want other men to find work for them; need others to watch over them in order to do their best work; and want others to lift them to better-paid work and work of a better sort.

They remain dependent children all their life long; and if they get some kicks and curses for leaning their weight on others who want to get ahead, or for hanging on to the coat-tails of men of greater strength and speed, they feel aggrieved, and develop socialistic views. And when old age comes, these leaners, grown feeble from their much dependence, may become a burden on their friends or kindred or perhaps on the State.

Leaners or Lifters—Which?

The question is inevitable: Are you a leaner or a lifter? If you are a leaner, and continue to be one, you cannot possibly earn as much as the man of equal fidelity, ability and performance with initiative and courage to exercise these qualities.

When you lean on a man—rely on him to find work for you and keep you at work, for wages—you pay him a substantial sum each year for the service you require of him. If you get from an employer $3.50 a day, then he expects to get back $5 or so for the $3.50 he gives you; and he gets this $5 or so out of what you produce. That is, he expects to get $1.50 a day, or $9 a week, or $450 a year per employee, over and above what he pays the employee. And if he employs 100 employees, it means that he gets $45,000 more than he pays them. Applied personally, it means that you, a leaner, pay your employer $450 or so each year as a fee for finding you work.

A Journeyman Plumber Gets the Right Idea

When this idea sank into the mind of a certain journeyman, he determined that he would sell himself to himself, and not to any other. He had a little money saved up—less than $500—and with this capital he opened up a small shop in the basement of his house. Here he worked nights until he developed a connection, so that it was not long before this man with initiative found it necessary to transfer his shop from the basement of his dwelling to a regular shop and to employ assistance. To-day this man is an employer, and is drawing a very satisfying income by collecting $1.50 a day or so from each of twenty men who want their jobs found and maintained for them.

IV.

HOW is it with you, brother? Are you depending on your fidelity, ability and superior performance to advance you in pay and position, or are you practising salesmanship—doing a little pushing on your own account in the direction you want to go? Are you acquiring more in order to be able to sell more—more education, more knowledge, more skill—in short, more of the kind of merchandise you are selling?

How are you using your spare time—the time you call your own? Are you converting it into capital for to-morrow's needs? Are you reading books above your level—the only kind of books that educate you, stimulate you, lift you? Do your dreams lull you to sloth and sleep, or do they drum you out of repose and inaction?

Time—your free time—is a god-mother, ready to bestow all manner of wealth on you, if you are her beloved child.

None but yourself condemns you to positions of lowliness and low pay. If you want to earn twice as much as you are now doing, you can surely do it, if you make yourself worth twice as much, and make others know your worth. It's all up to you.

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RESEARCHES ON TIN AND TUNGSTEN

THE *Board of Trade Journal*, London, England, says that one of the most attractive fields for investigation being opened by the exigencies of the war is that which pertains to the winning of tin and tungsten. Recently some successful experiments have been made with a view to increasing the recovery of tin. No systematic researches, however, have been undertaken beyond those designed to improve the appliances now in use; and, having regard to this fact, the Privy Council Committee for Scientific and Industrial Research has expressed the hope that a research association might be established in order that the series of investigations already undertaken might be continued with fresh vigor on a larger scale.

One of the difficulties in the way hitherto has been the want of adequate funds for sustained investigation and experimental trials. But the Ministry of Munitions, represented by the department for the development of mineral resources, is now venturing on a strong effort to make progress possible, and is suggesting that those interested in the tin and tungsten mines of Cornwall and Devon should co-operate in the establishment of a research association, and contribute to a central fund devoted to a study of the many-sided aspects of the problem. In this way adequate means might be provided annually for two or three years; and with such a fund, supplemented if necessary by a grant from the Committee of the Privy Council, experimental researches upon scientific principles could be conducted

◆

ETCHING BRASSES AND BRONZES

A FEW drops of a strong solution of hydrogen peroxide added to a very dilute solution of chromic acid is used. The article is immersed and kept moving in the solution for a few seconds. It is then removed and washed immediately in running water. The reagent is equally satisfactory for brass or bronze, and gives much better results than chromic acid alone.

PART 2.

The uncovering and reclamation of Canada's mineral resources contribute no insignificant chapter to her national development progress. The subject matter of the accompanying review prepared from official records for the Mail and Empire's Special Trade Expansion Number points to such a conclusion. Following a general reference to the Dominion production as a whole, the hidden wealth of each Province is discussed in its variety detail.

PROVINCE OF PRINCE EDWARD ISLAND

THIS Province, consisting of the island of this name in Gulf of St. Lawrence, has, practically speaking, no mineral resources or industries. It is uniformly fertile, is well peopled, and has important fisheries. Red sandstone suitable for masonry may be quarried in some places, and clays occur that may be used for brick-making. It may be that coal seams underlie the island or some part of it, but if so, they appear to be at a depth too great for meantime utilization.

PROVINCE OF QUEBEC

In the earliest historical records of the Province of Quebec, the references to mining are very meagre. In 1737, the right of mining and smelting iron ore in the district of St. Maurice, near Three Rivers, was granted to a company by Louis XIV., then King of France. From that date until recent years, the mining and dredging of bog or cake ore, the metallurgical reduction of same into pig iron, had been carried on at the Rednor and Drummondville furnaces as an important industry. Several other attempts to smelt iron ore on a commercial scale were made at Moisie in 1867; at St. Urbain in 1873; at Hull in 1867 and 1872; but with only partial success.

Quebec, with its boundaries extended to include the great north country of Ungava, reaching to the shores of Hudson Bay and Hudson Strait, is geographically the largest Province in the Dominion of Canada, but, as in all of the Central and Western Provinces, the settled or populated section is confined to a comparatively narrow fringe of territory along the southern border, the greater part of the northern area being for the most part unexplored.

Quite a variety of mineral products are to be found in Quebec Province, among which may be noted the following:— Zince ore, copper, gold, iron ore, silver, asbestos, feldspar, graphite, magnesite, mica, mineral waters, ochres and iron oxides, peat, phosphate, pyrites, quartz, cement, clay products, kaolin, lime, slate, stone, etc. In the southeastern portion of the Province, south of the St. Lawrence River, in an area known as the Eastern Townships, are to be found alluvial gold deposits, copper pyrites, asbestos, chromide deposits, bog iron ores, also large marble and granite quarries. North of the St. Lawrence are bog iron ores at Three Rivers, and titanium ores north of Montreal, while further west, and north of the Ottawa River, are to be found magnesite, graphite, phosphate, feldspar, mica, barytes, iron ore, and molybdenite, with lead and zinc at Notre Dame des Anges, Calumet Island, and near Lake Timiskaming.

The asbestos deposits are extensively quarried and supply a large percentage of the world's requirements of this product are, perhaps, the most important of the mineral resources of the Province. The alluvial gold deposits have not been productive for several years, yet investigation appears to indicate that there are still opportunities for development. The production of chromite and phosphate has been limited by the availability of more cheaply mined products in other countries. Natural gas has been found in the vicinity of Three Rivers. The limestone and igneous rocks of the Province furnish almost inexhaustible cement building resources, as well as ornamental stone and materials of construction generally. Provincial clays are extensively employed in the manufacture of sewer pipe, brick, etc. Phosphorus has been manufactured in electric furnaces at Buckingham, and occasionally ferro-alloys such as ferro-phosphorous and ferro-chrome. Aluminum is manufactured at Shawinigan Falls from imported bauxite ores.

Production of Silver by Provinces, 1887-1916.

Year	Ontario		Quebec		British Columbia		Yukon Territory	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
1887	190,495	$ 186,304	146,898	$143,666	17,000	$ 17,301	......	......
1888	208,064	195,580	149,388	140,425	79,780	74,993	......	......
1889	181,609	169,986	148,517	139,012	53,192	49,787	......	......
1890	158,715	166,016	171,545	179,436	70,427	73,666	......	......
1891	225,633	222,926	185,584	183,357	3,306	3,266	......	......
1892	41,581	36,425	191,910	168,113	77,160	67,592	......	......
1893	......	8,689	......	126,439	......	195,000	......	......
1894	......	......	101,318	63,830	746,379	470,219	......	......
1895	......	......	81,753	53,369	1,496,522	976,930	......	......
1896	......	......	70,000	46,942	3,135,343	2,102,561	......	......
1897	5,000	2,990	80,475	48,116	5,472,971	3,272,289	......	......
1898	85,000	49,521	74,932	43,655	4,292,401	2,500,753	......	......
1899	202,000	120,352	40,231	23,970	2,939,413	1,751,302	230,000	$137,034
1900	161,650	99,140	58,400	35,817	3,058,175	2,427,548	290,000	177,857
1901	151,400	89,250	41,459	24,440	5,151,333	3,036,711	195,000	114,953
1902	145,000	75,632	42,500	22,168	3,917,917	2,043,586	185,900	96,985
1903	17,777	9,502	28,600	15,287	2,996,204	1,601,471	156,000	83,362
1904	206,875	118,376	15,000	8,583	3,222,481	1,843,935	133,170	76,201
1905	2,451,356	1,479,442	19,620	11,841	3,439,417	2,075,757	89,630	54,093
1906	5,401,766	3,607,894	17,686	11,813	2,990,262	1,997,226	63,665	42,522
1907	9,982,363	6,521,178	16,000	10,452	2,745,448	1,793,519	35,988	23,510
1908	19,398,545	10,254,847	13,299	7,030	2,631,389	1,391,058	63,000	33,304
1909	24,822,099	12,784,126	13,233	6,815	2,649,141	1,364,387	45,000	23,176
1910	36,366,366	16,241,755	7,593	4,061	2,407,887	1,287,883	87,418	46,756
1911	30,540,754	16,279,443	18,435	9,827	1,887,147	1,005,924	112,708	60,078
1912	29,214,025	17,772,352	9,465	5,758	2,651,002	1,612,737	81,068	49,318
1913	28,411,261	16,987,377	34,573	20,672	3,312,343	1,980,483	87,626	52,392
1914	25,139,214	13,779,055	57,737	31,646	3,159,897	1,731,971	92,973	50,959
1915	22,748 609	11,302,419	63,450	31,524	3,565,852	1,771,658	248,049	123,241
1916	21,975,942	14,429,623	97,000	63,691	3,235,764	2,124,635	360,466	236,686

PROVINCE OF ONTARIO

Ontario has the distinction of possessing not only the greatest variety of mineral products, but also of delivering the biggest annual output of all the provinces of the Dominion. Some idea of the extent and variety of her resources may be gathered from the following detail:—Lead, nickel oxide, cobalt oxide, cobalt residues and mixed oxides, copper, gold, pig iron from domestic ore, nickel silver, zinc ore, actinolite, arsen-

ious oxide, corundum, feldspar, fluorspar, graphite, gypsum, mica, mineral water, natural gas, peat, petroleum, pyrites, quartz, salt, talc, cement, clay products, lime, sand-lime brick, stone, etc., are available in greater or lesser quantity.

Annual Production* of Cement.

Calendar Year	Natural rock cement Barrels	Natural rock cement Value	Portland cement Barrels	Portland cement Value	Total Barrels	Total Value
1887	......	......	....	....	69,843	$ 81,909
1888	......	......	....	....	50,668	35,593
1889	90,474	$ 69,790	Nil.	Nil.	90,474	69,790
1890	87,521	74,822	14,695	$ 17,583	102,216	92,405
1891	90,846	103,479	2,633	5,082	93,479	108,561
1892	88,187	94,912	29,221	52,751	117,408	147,663
1893	126,673	130,167	31,924	63,848	158,597	194,015
1894	72,965	74,842	35,177	69,795	108,142	144,637
1895	66,219	60,795	62,075	112,880	128,294	173,675
1896	70,705	60,500	78,385	141,151	149,090	201,651
1897	85,450	65,893	119,763	209,380	205,213	275,273
1898	87,125	73,412	163,084	324,168	250,209	397,580
1899	147,387	119,308	255,366	513,983	396,753	633,291
1900	125,428	99,994	292,124	562,916	417,552	662,910
1901	133,328	94,415	317,066	565,615	450,394	660,030
1902	127,931	98,932	594,594	1,028,618	722,525	1,127,550
1903	92,252	74,655	627,741	1,150,592	719,993	1,225,247
1904	56,814	50,247	910,358	1,287,992	967,172	1,338,233
1905	14,184	10,274	1,346,548	1,913,740	1,360,732	1,924,014
1906	8,610	6,052	2,119,764	3,164,807	2,128,374	3,170,859
1907	5,775	4,043	2,436,903	3,777,328	2,441,868	3,781,371
1908	1,044	815	2,665,289	3,709,139	2,666,333	3,709,954
1909	0	0	4,067,709	5,345,802	4,067,709	5,345,802
1910	0	0	4,753,975	6,412,215	4,753,975	6,412,215
1911	0	0	5,692,915	7,644,537	5,692,915	7,644,537
1912	0	0	7,132,732	9,106,556	7,132,732	9,106,556
1913	0	0	8,658,805	11,019,418	8,658,805	11,019,418
1914	0	0	7,172,480	9,187,924	7,172,480	9,187,924
1915	0	0	5,681,032	6,977,024	5,681,032	6,977,024
1916	0	0	......	......	5,359,050	6,529,861

*Quantities sold or used.

The principal metalliferous ores are the nickel-copper deposits of the Sudbury district; the silver-cobalt-nickel arsenides of the Cobalt and surrounding areas; the goldfields of Eastern Ontario and of Porcupine; numerous other widely scattered areas in the northern and western sections; the iron ores of Hastings and Frontenac Counties, of Moose Mountain, north of Sudbury, of Michipicoten south-west of Sault Ste. Marie, of Atikokan, west of Port Arthur, in addition to numerous undeveloped deposits throughout the northern and western parts of the province.

The occurrence of native copper on both shores of Lake Superior was apparently known to the Indians in very remote days, as evidenced by ancient workings. The attention of Europeans was not, however, drawn to the matter until about the year 1767, when a trader named Henry, who had passed the winter on Michipicoten Island, reported the existence of lead at Mamianse, and of gray ore of copper, there and at various other places. Three years later a company was organized in England to work mines in the Lake Superior district, but the vein on which mining was undertaken narrowed to four inches after sinking had been carried down some 30 feet, and discouraged by this circumstance the work was abandoned.

No further effort in the direction of copper mining in Canadian territory was made until 1845, when a company was organized in Montreal to explore for minerals on the north shore of Lake Superior. Two parties, numbering in all eighty or ninety persons, were sent out, and the coast from Sault Ste. Marie to Pigeon River, a distance of approximately 500 miles was surveyed, and 18 tracts or mineral locations—each 10 square miles—were taken up; their subsequent development, however, proved productively disappointing. Some 21 years later, the celebrated Silver Islet silver vein was discovered within the limits of one of these tracts. In 1847, the company above referred to purchased from the discoverers the Bruce Mines locations, and during the next three years expended a large sum of money in developing and equipping the property; but no profits were realized until 1853 when a small dividend was paid. Unprofitable operations were continued until 1865, and again at intermittent periods under different managements.

Several other mines were worked in the earlier years of Canada's industrial development, but the only discovery of special historic interest was that of the Wallace Mine in 1846, near the mouth of Whitefish River on the north shore of Lake Huron. This was notable since it was the first recorded discovery of nickel in the province, although not apparently occurring in sufficient quantity to justify extensive exploration. Ten years later, nickel and copper ores were discovered six miles north of Whitefish Lake and less than half a mile distant from what is now the main pit of the Creighton Mine; probably the most important deposit of nickeliferous pyrrhotite in the world. No developments, however, were undertaken until several years later, when the district became readily accessible by the construction in 1884 of the Canadian Pacific Railway. Within ten years from that date, all the present important productive mines were located. The ores were first mined for their copper content alone in 1886, production in that year amounting to 3,307 tons, valued at $16,404; but in 1887 the output decreased to 567 tons.

Nickel Resources

The discovery of the presence of nickel in the ores of the district is claimed by Robert R. Hedley, who was engaged at the time as assayer for the Orford Copper Co., and as a direct result, a plant was shortly afterwards installed by the Canadian Copper Co. for the production of copper and nickel matte. In October, 1888, Francis L. Sperry, chemist for the latter concern, found that the ores from the Vermilion Mine contained an arsenide of platinum, which was subsequently named sperrylite in honor of its discoverer. The Canadian Copper Co. was organized in January, 1886, with a capital of $2,000,000 to operate the Copper Cliff, Stobie, and Evans mines. The first blast furnace was blown in at the close of 1888, and in the autumn of 1889, a second blast furnace was in operation. The Creighton Mine which was destined to become later the main source of the company's ore supply, was not opened until the year 1900.

Annual Production of Nickel.

Calendar Year	Pounds of nickel in matte shipped	Cents per pound	
1889 (a)	830,477	60	$ 498,286
1890	1,435,742	65	933,232
1891	4,035,347	60	2,421,208
1892	2,413,717	58	1,399,956
1893	3,982,982	52	2,071,151
1894	4,907,430	38½	1,870,958
1895	3,888,525	35	1,360,984
1896	3,397,113	35	1,188,990
1897	3,997,647	35	1,399,176
1898	5,517,690	33	1,820,838
1899	5,744,000	36	2,067,840
1900	7,080,227	47	3,327,707
1901	9,189,047	50	4,594,523
1902	10,693,410	47	5,025,903
1903	12,505,510	40	5,002,204
1904	10,547,883	40	4,219,153
1905	18,876,315	40	7,550,526
1906	21,490,955	42	8,948,834
1907	21,189,793	45	9,535,407
1908	19,143,111	43	8,231,538
1909	26,282,991	36	9,461,877
1910	37,271,033	30	11,181,310
1911	34,098,744	30	10,229,623
1912	44,841,542	30	13,452,463
1913	49,676,772	30	14,903,032
1914	45,517,937	30	13,655,381
1915	68,308,657	30	20,492,597
1916	82,958,564		29,035,497

(a) Calculated from shipments made by rail.

In 1902 the International Co. was organized in New Jersey, U.S.A., to consolidate and control the nickel production of the world, the various concerns, the Copper Co., the Orford Copper Co., the Anglo-American Iron Co., and the Mermilion Mining Co., constituting the merger. Since then, operations have been conducted on an increasingly important and comprehensive scale. Among other important resources development relating to the Sudbury district may be mentioned those of the Victoria Mines of the Mond Nickel Co. which are operated independently of the International Co. Nickel production on a limited scale has been secured from the silver-cobalt mines of the Cobalt district. While the nickel-copper mines of the Sudbury district are the chief source of the copper production in Ontario, a considerable tonnage of copper ores is obtained from the copper mines on the north shore of Lake Huron, the copper from which averages fully 4 per cent.

The nickel deposits of the Sudbury district are probably the most important of the known sources of nickel, and supply an increasingly large portion of the world's requirements. The ore reserves are known to be enormous, and nickel production is going up by leaps and bounds, the total for the year 1916 being in round figures $83,000,000 pounds, as compared with something like 50,000,000 pounds three or four years ago. Not only copper, but small amounts of gold, silver, platinum, and palladium constitute valuable by-products.

The nickel-copper ore, derived from nine separates mines in the Sudbury district, supplemented by a small tonnage of similar ores from the Alexo Mine in Timiskaming is reduced in smelters and converters at Copper Cliff, and Coniston to a Bessemer matte containing from 77 to 82 per cent. of the combined metals and is shipped in that form to Great Britain and the United States for refining, the product of the Canadian Copper Co. going to New Jersey, and that of the Mond Nickel Co. to Wales. A refinery is now under construction at Port Colborne, Ont., by the International Nickel Co., in which a portion at least of the matte produced by the Canadian Copper Co. will be refined. The British American Nickel Corporation has been actively engaged during the past year in the development of its nickel properties in the Sudbury district and in the erection of a smelter.

Silver Production

Towards the close of the eighteenth century, silver was understood to have been located by a Russian explorer just across the Canadian border near Sault Ste. Marie, but the first discovery of importance on the north shore of Lake Superior was not made until 1866, when the Thunder Bay Mine was staked off. Several other silver mines were worked during the next three or four years, but the silver yield was at best inconsiderable until 1870, when an American syndicate acquired a mining tract of 107,000 acres, in which was included the famous Silver Islet Mine. The purchase price was $225.000, and the sellers were the Montreal company already referred to in connection with the mining of copper. Before operations were suspended on the Silver Islet property, in 1884, ore to the value of $3,089,157 had been extracted, the general average value being something just under $1.500 per ton, although a number of shipments yielded as high as $7.000 per ton. At other mines in the vicinity, rich but limited shoots of ore were worked for a period, while other discoveries were made from 1882 onward. Production steadily declined, however, the output value falling in 1903 to $8,949.

Annual Production of Gypsum.

Calendar Year	Tons	Value
1886	162.000	178.742
1887	154,008	157,277
1888	175,887	179,393
1889	213,273	205.108
1890	226.509	194.033
1891	203,605	206,251
1892	241.048	241,127
1893	192,568	196.150
1894	223,631	202,031
1895	226.178	202.608
1896	207.032	178,061
1897	239,691	244,531
1898	219,256	232,515
1899	244.566	257,329
1900	252.101	259.009
1901	293,799	340,148
1902	333,599	379,479
1903	314.489	388,459
1904	345,961	373,474
1905	469,022	643.294
1906	469,022	643.294
1907	485.921	646.914
1908	340.964	575.701
1909	473,129	809,632
1910	525.246	934,446
1911	518,383	993,394
1912	578,458	1,324,620
1913	636.370	1,447,739
1914	516,880	1,156,207
1915	474,815	854.929
1916	341,618	730,831

In the autumn of 1903, the first discoveries of the phenomenally rich silver-cobalt-nickel ores of the Cobalt area were made, being, so to speak, an immediate result of the installation of the Timiskaming & Northern Ontario Railway in that region. As a consequence, we find the production of silver increasing in the Province from 17,777 fine ounces in 1903 to 2,451,356 fine ounces in 1905, and reaching a maximum of 30,540,754 fine ounces in 1911. The maximum value $17,772,352 was reached in 1912. The 1916 silver output of the province amounted to 21,975,942 ounces valued at $14,429,623, or 85.6 per cent. of the whole production of the Dominion.

It is of importance to note that the production from the ores of Cobalt and adjoining silver camps account for 21,885,057 ounces of the 1916 total.

Gold Production

As in the production of silver, so with gold, the province of Ontario occupies premier place in the whole Dominion, having done so since 1914. Although gold had been found in a number of different localities, and gave early promise of becoming an important industry, it has only been since 1913 that anything approaching the nature of the latter has been realized. In that year the gold production of the province exceeded the total of all the other years since 1886, only to be doubled itself in turn by the production for 1916, which amounted to 489,679 fine ounces valued at $10,122,563. The Porcupine district, has, since its development, been the main producer. Other producing territories are those of Kirkland Lake and Munro Township in the Timiskaming district, and Long Lake near Sudbury in the Algoma district. The remarkable increase of the last four years has been brought about by the successful development of the Porcupine district and of course more recently still by the extension of milling facilities in that camp. To the 1916 output, the Hollinger Consolidated Mines contributed about 48 per cent., and the Dome about 21 per cent.

Copper Production

The Ontario production of copper comes principally from the nickel-copper ores of the Sudbury district and from the Alexo Mine in Timiskaming, supplemented by a small recovery from the Cobalt district silver ores and by shipments made from six copper properties under development. The total production in 1916 was 44,997,035 pounds, being an increase of 12½ per cent. over the previous year.

Iron Ore and Miscellaneous

Although a number of locations of iron ore have been determined in the province, some expressive of very extensive ore bodies, actual mining has been carried on in but few instances. Mining operations are largely confined to the Helen and Magpie Mines of the Algoma Steel Corporation in the Michipicoten district. The total shipments in 1916 were 339,600 short tons valued at $814,004, as compared with 398,112 tons valued at $774,427 shipped in 1915.

Such of the mineral resources of the province as have been already featured have been dealt with at greater or lesser length because of their meantime special commercial and manufacturing importance, and also because of the fact that in quite recent years specially marked activity has been in evidence relative to them. Regarding the mineral wealth of the province generally, it may be said that same in a variety form is well distributed. In the eastern portions are to be found important deposits of corundum, feldspar, fluorspar, graphite, mica, phosphate, pyrites, talc, lead and zinc ores, etc.; while in the southern section, including a highly developed agricultural area, are found deposits of petroleum, natural gas, gypsum, and salt; this area also contains numerous stone quarries, lime kilns, clay and cement plants. In one very essential resource, that of coal, either anthracite or bituminous, Ontario is absolutely lacking so far as known up to the present.

Blast furnaces for the reduction of iron ore are installed at Hamilton, Deseronto, Port Colborne, Midland, Parry Sound, Sault Ste. Marie, and Port Arthur, while metallurgical plants for the reduction of nickel, copper, silver, or

Annual Production of Zinc.

Year	Zinc Ore Shipped		Metallic Zinc in Ore Shipped	
	Tons	Spot value	Pounds	Final value
1898	1,162	$11,000	788,000	$36,011
1899	865	18.165	814,000	46,805
1900	261	4,810	212,000	9,342
1901	...	....	......	....
1902	158	1,659	142,200	6.882
1903	1,000	10.500	900,000	48,660
1904	597	3.700	477.568	24.256
1905	9,413	139.200	*	*
1906	1,154	23.800	*	*
1907	1,573	49,100	*	*
1908	452	3.215	*	*
1909 (a)	18,371	242,690	16,468,204	906,245
1910	5.063	120.003	4.361,712	240,766
1911	2,590	101,072	2,346,849	135,132
1912	6.415	215,149	5,354,700	371,777
1913	7,889	186.827	7,060,800	371,302
1914	10.893	262,563	9,101,460	474,459
1915	14,895	554,938	12,231,439	1,618,219

*Figures not available.

(a) Includes 7,424 tons shipped late in 1908.

lead ores, are to be found at Copper Cliff, Coniston, North Bay, Orillia, Thorold, Kingston, Deloro, etc.; electric furnaces for the production of ferro-alloys are located at Welland and Sault Ste. Marie. For the encouragement of metal refining, a small bounty is offered for the production of refined nickel, nickel oxide, cobalt, cobalt oxide, copper sulphate, and on white arsenic from mispickel ores, under the conditions and regulations provided in the "Metal Bounty Refining Act."

PROVINCE OF MANITOBA

Outside of clay and quarry products, gypsum is the only mineral being mined in the province of Manitoba, although the occurrence of gold has been noted, and gold claims have been exploited on the south-eastern border of the adjoining Ontario boundary and in an area immediately east of Lake Winnipeg. Salt was for many years produced in small quantities from brine near Lake Winnipegosis. There is also a lignite coalfield of considerable extent near the southern boundary of the province, but mining operations have not been conducted thereon. Gypsum is quarried near Lake St. Martin, north of Lake Winnipeg, and is calcined in mills in Winnipeg. Portland cement is made in the latter from local clays and limestone is obtained about 130 miles further north. A natural Portland cement is also made at Babcock. Clay products, chiefly building brick, are manufactured in numerous localities. Limestone is quarried for building stone, and the manufacture of lime is carried on at Stonewall, Stony Mountain, Tyndall, etc.

PROVINCE OF SASKATCHEWAN

The provinces of Manitoba, Saskatchewan and Alberta embrace an enormous area of comparatively level land, and are essentially agricultural territory. Each, however, is underlain by important coal areas, consisting of lignites in the two former, changing to bituminous and semi-anthracite as the "Rockies" are approached. The raw materials for the manufacture of brick, tile, and cement are found in fair quantity in Saskatchewan, while limestones and building stones also occur. Lignite coal is mined in the southern part or the province at Estevan, Roche Percée, Pinto, Bienfait, and the Dirt Hills district. Coal has also been reported near Wood Mountain in the Eagle Hills, and on the Saskatchewan River near Swift Current. Brick clays are widely utilized, and to the south of Moose Jaw a refractory clay is found which has been employed in the manufacture of fire brick. The sands and gravels of the province are largely used for concrete work of all kinds. Natural gas has not yet been obtained in commercial quantities but there is expectation that it will shortly be found In the northern part of the province in the Beaver Lake district some gold has been located.

The coal deposits of Saskatchewan furnish coal of the lignite variety only, and as some of the physical characteristics of same in its raw state tend to prevent its successful and economic use, the production of recent years shows but a slight increase, in no way comparable to the increase of population of the province, and the consequent increased demand for fuel for heating and power purposes. The importance of devising better methods for the utilization of the lignite has prompted both the government and the province fuel testing division of the mines branch, Ottawa, to undertake investigation of Western lignites. The production for the year 1916 amounted to 280,835 tons of a value of $442,136, the increase in each case being of a substantial nature as compared with the immediately preceding years.

Annual Production of Silver.

Year	Ounces	Value
1887	355,083	$347,271
1888	437,232	410,998
1889	383,318	358,785
1890	400,687	419,118
1891	414,523	409,549
1892	310,651	272,130
1893	......	330,128
1894	847,697	534,049
1895	1,578,275	1,030,299
1896	3,205,343	2,149,503
1897	5,558,456	3,323,395
1898	4,452,333	2,593,929
1899	3,411,644	2,032,658
1900	4,468,225	2,740,362
1901	5,539,192	3,265,354
1902	4,291,317	2,238,351
1903	3,198,581	1,709,642
1904	3,577,526	2,047,095
1905	6,000,023	3,621,133
1906	8,473,379	5,659,455
1907	12,779,799	8,348,659
1908	22,106,233	11,686,239
1909	27,529,473	14,178,504
1910	32,869,264	17,580,455
1911	32,559,044	17,355,272
1912	31,955,560	19,440,165
1913	31,845,803	19,040,924
1914	28,449,821	15,593,630
1915	26,625,960	13,228,842
1916	25,669,172	16,854,635

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AMERICAN FOUNDRYMEN'S ASSOCIATION ACTIVITIES

THE War Service Committee of the American Foundrymen's Association has appointed C. E. Hoyt, of Chicago, secretary, and has established offices in the National Union Building, 918 First St., N.W., Washington. From these headquarters will be directed all of the committee's activities in connection with co-operation with the government. Subcommittees on malleable and gray iron castings already have been named and a sub-committee on non-ferrous castings is being selected. A questionnaire has been prepared and will be mailed out to all of the foundrymen of the United States, and from the data thus obtained, a survey of the foundry trade of that country will be made. Information is being sought on the melting equipment, capacity, fuel capacity, etc., of all castings plants, and when compiled this information will be available to all of the purchasing agents of the different government buying departments.

R. A. Bull, Duquesne Steel Foundry Co., Pittsburg, chairman of the American Foundrymen's War Service Committee and a Major in the Officer's Reserve Corps, has resigned, having been called for active duty. He has been succeeded by H. D. Miles, vice-chairman Buffalo Foundry & Machine Co., Buffalo.

The malleable and gray iron subcommittees already appointed are constituted as follows:

Malleable Iron.

Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.

H. F. Pope, National Malleable Castings Co., Cleveland.

F. L. Sivyer, Northwestern Malleable Iron Co., Milwaukee.

John E. Walker, Wilmington Malleable Iron Co., Wilmington, Del.

John C. Haswell, Dayton Malleable Iron Co., Dayton, Ohio, who also is a member of the General Committee representing the malleable cast iron industry.

Gray Iron.

Henry A. Carpenter, General Fire Extinguisher Co., Providence, R.I.

W. D. Tynes, Hardie-Tynes Mfg. Co., Birmingham, Ala.
land.

F. B. Whitlock, Interstate Foundry Co.. Cleve-
W. P. Whelan, Western Foundry Co., Chicago.

◆

DOMINION STEEL CORPORATION PRODUCTION.

THE output of the Dominion Steel Corporation for the year ending December 31, 1917, is estimated as follows:

Pig iron, 341,000 tons; steel ingots, 353,000 tons; blooms, billets, etc., for sale, 154,000 tons; rails, 16,000 tons; wire rods, 100,000 tons; merchant bars, 1,300 tons; wire and product of wire, 35,700 tons; ore, 651 gross tons; stone, 524,000 tons.

During the past year the reconstruction of a 400-ton blast furnace was undertaken and practically completed; this should be ready for operation during March, 1918, at about which date there will also be completed the construction of 120 latest design Koppers By-Product Coke Ovens. The company has recently undertaken extensive improvements to the electrical power and water supply equipment of the plant, and this work will be pushed to completion as rapidly as possible.

According to the president, Mark Workman, the 1917 output of coal will fall at least 500,000 tons below that of 1916, and 1,250,000 tons below normal. The record for 1917 probably will be below 4,000,000 tons, as compared with 5,200,000 tons in 1914, which was itself below the average year. The cause of this rests in a serious scarcity of labor. Since the war broke out 4,500 men have enlisted from the workers in the Dominion Coal Company's mines, and of these a bare 1,000 have been replaced, and much of the substitute labor is much weld had been made and while the metal below the former standard.

The falling off in the coal output is being felt seriously in Montreal, as ordinarily 2,000 tons are shipped up the River St. Lawrence, and very little has come up this past season. The Dominion Government is alive to the situation and efforts are being made through Senator Robertson, a member of the Cabinet, to provide these men. An increase of wages may be the result, although very recently some action was taken in this direction. The yearly output has not fallen below 4,000,000 tons since 1909.

The record for the past twelve years has been:

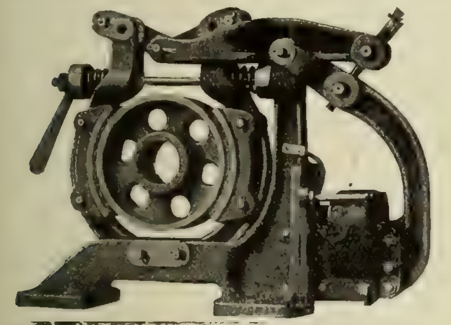
Year.	Tons.
1917 .... (under)	4,000,000
1916	5,261,198
1915	4,550,510
1914	5,047,682
1913	5,053,163
1912	4,406,263
1911	4,412,639
1909	2,734,774
1908	3,555,068
1907	3,541,253

However, for all the decline in coal, the recent increase in the dividend was not brought into effect on falling earnings.

Canada."

MAGNETIC BRAKES

A NEW design of direct current magnet brake has been developed for use with mill, crane and hoist motions. As shown in the accompanying illustration the magnet armature is of the clapper type which eliminates the necessity of having any moving parts within the coil and consequently ensures freedom from wear, sticking or damage to the insulation of the coil windings.



MAGNETIC BRAKE FOR USE WITH MILL, CRANE AND HOIST MOTIONS.

These brakes are characterized by the quickness of their operation. They respond almost instantly, "releasing" when the power is applied and "setting" when the power is cut off. This is due to the design of the operating magnet which gives high initial pull and a very small distance of travel (¼ inch to 1 inch).

The operating of the brakes is as follows:

When voltage is impressed on the motor the magnet is energized and the magnet armature lever overcomes the pressure of the compression springs through a toggle and releases the brakeshoe grip upon brake wheel. Whille the magnet remains energized the brake wheel is allowed to rotate freely. As soon as the current is shut off from the motor the brake magnet releases and the compression springs force the shoes against the brake wheel and bring the motor quickly and smoothly to rest without shock or jar. The compression exerted by the springs can be easily adjusted so that any holding or retarding torque up to the full capacity of the brake can be obtained for equal braking effort for both directions of rotation. Simple means for making adjustment for shoe wear are provided.

In case adjustments for shoe wear should be neglected a safety feature has been introduced so that the brake does not fail to hold the load but the magnet will not release the grip on the brake wheel. This insures proper brake operation and the elimination of accidents due to the slippage of the brakewheel.

As a product of the Westinghouse Electric and Mfg. Co. the new brake shows in design a close adherence to their alternating current type of brake except in the necessary alterations in magnet and armature lever but the features of simplicity and accessibility of the few parts are typical of both types.

◆

THE EDUCATION OF THE ALIEN

Walter P. Miller*

THE problem of the foreigner in industry is one that needs to be carefully worked out by the employer to a proper conclusion without undue delay. The census of 1910 tells us that there are in the United States about three million adult non-English speaking aliens. All races are included in this survey, which represents Albanians, Armenians, Austro-Hungarians, Chinese, Danes, Finns, French, Germans, Greeks, Italians, Lithuanians, Magyars, Norwegians, Persians, and other nationalities.

Each immigrant group finds a settlement of its own here in our various settlement centers. The colonies do not fraternize with the English-speaking people, but conform to the customs and habits of their native lands. A knowledge of the English language would help to broaden the mental horizon of these people, would induce them to take an interest in things that are American, and would be a stepping stone toward the attainment of citizenship.

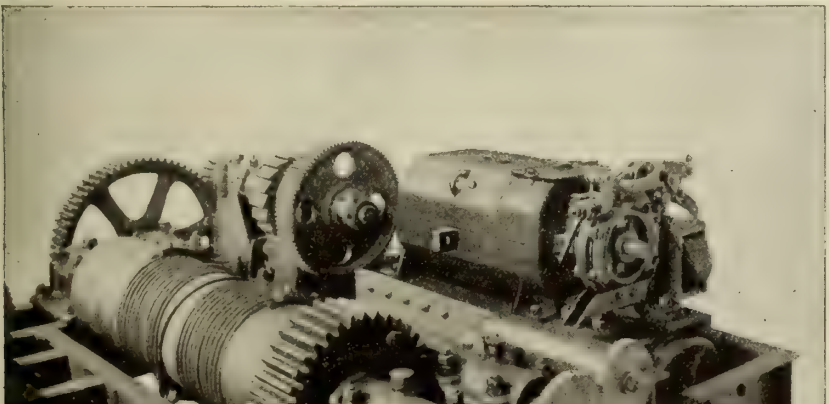
At the present time the foreigner is in demand in the industrial works of our country as he never has been before. The Ford motor works, employing an army of all nationalities, soon found it necessary to take steps to educate these foreigners, giving them an understanding of the English language in order to secure that degree of efficiency that was necessary to their business.

A little thought on the subject will make it unnecessary to reiterate the importance of an alien employee learning to speak English. It is to him an opportunity for better wages, because he can adapt himself intelligently to the work that he is given to do. It secures to him better protection from accidents, because he can read the signs and understand the word of warning that is spoken. His standards of living must necessarily keep progress with his educational advancement, and the holding of property is not a far cry to his ambition. We have, therefore, a better citizen, paying taxes, sending his children to school, a permanent resident of the community, identified with local organizations, and one who thinks of the place he lives in as home.

The solution of the problem of the foreigner can be worked out by no one more successfully than the employer, and the great need for the business man to appreciate how necessary it is for him to lend himself for the encouragement of the education of the foreigner.

If the business men in every community will take an active part in seeing that the foreigner is directed to such schools in his immediate neighborhood that can and will give him the necessary instruction, see that he attends regularly and that his interest is maintained, they will reap the reward of a better emcreased production with its logical sequence of less overhead expense and more profits to the business.

To the community we shall have added a loyal citizen who has detached himself from his racial group, swearing allegiance to but his adopted country, and, if necessary, giving to his adopted country even life itself, that his children may enjoy the blessings of peace and prosperity.



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*Chairman of the Committee on Americanization, Philadelphia Chamber of Commerce.

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DON'T TRY FOR AN AVERAGE

ONE point that is being persistently emphasized in connection with the making of shells is that each shell must pass on its own merits.

That's quite an acid test to apply to many other things besides shells.

It simply means putting the hundred per cent. efficient measure up beside everything you do.

It's the very opposite to the theory of getting past when the crowd's going through.

A man may have some good qualities. He may have some bad ones as well. His friends put the good and the bad together, and a process of mental juggling turns out the verdict that he's not such a bad sort.

You can't juggle with good shells and bad shells and produce a carload of shells that, on the average, are fairly good.

Why not apply this to your work—to your business? If you've got weak spots in your organization—if there are limping traits in your own character—don't depend on something that's stronger to come along and strike a decent average.

Put the shell test to it. Good or bad. Which?

Get the crutches out of your system—out of your organization. In the last analysis there can be only two big classes, (1) efficient, or (2) non-efficient.

◆

MINERS DIDN'T WANT THEM

THE Amalgamated Mine Workers of Nova Scotia did not take kindly to the idea of having Chinese labor employed in the mines with them in order to increase the output.

The Fuel Controller brought up the matter of Chinese labor. The mine workers turned it down.

The Controller offered to allow them to collect a sufficient sum from the Chinese to pay their fare back to China as soon as the need for their services was over. The miners did not entertain this proposition for a minute.

It can hardly be urged that Chinese labor is being received with the open-arm policy in the Dominion.

At the recent meeting of the Ontario Experimental Union held in Guelph at the O. A. C., Dr. Creelman, Commissioner of Agriculture for Ontario, put out the same suggestion. He was of the opinion that the big chance to relieve the labor situation lay with the Chinese coolies.

It was apparent that Dr. Creelman put the suggestion out simply as a feeler. To be quite frank, the response in the agricultural world was at zero.

Agriculture and mining camps are generally favorite pursuits for the Celestials where they are allowed to operate. These two doors have been closed to them here to all intents and purposes.

Canadians don't seem to mind if the Chinese do come in and paint laundry tickets for them. Apart from that their reception hasn't been particularly cordial.

◆

A SHIPBUILDING NATION

NOT long ago it was considered right and proper to refer to Canada as the "granary of the Empire." There is, of course, nothing wrong about this. The name got its origin in the time when the west was making such strides in development.

But Canada is going to be more than a granary. The Dominion is a machine shop as well.

The Dominion is also striking a pace as a shipbuilding nation that will make one wonder in a short time whether the agricultural interests are not going to be hard pressed to maintain for all time to come their outstanding superiority.

In 1880 the tonnage built in Canadian yards was 65,441. In 1918 it is estimated, on a very conservative basis, that the total tonnage will be 400,000.

A point is raised in connection with the new shipbuilding industry that should not be missed. When there is a rush for any given product, the tendency invariably is to open up new plants, and in this way increase the output.

Keep this in mind—**the big demand now is not for more shipyards, but for more finished ships.**

To establish new yards would simply mean drawing off or lessening the number of men available in each yard, as the supply of men who have the training and skill for this class of work is limited.

The more the men are spread about the fewer the ships that will slip into the water in a given time.

Under the stress of the times it is easy to see that it is much more important to get a few ships into service than have a large number under construction, and none of them immediately available for the work which is so imperatively urgent.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

CORROSION OF IRON AND STEEL AND ITS PREVENTION—II

By Abe Winters

IT is generally recognized that the corrosion of a metal or alloy is intimately connected with the formation of local electrolytic couples at the surface in contact with the solution or the atmosphere. The process of corrosion is always initially one of chemical solution, the dependence of which on electrolytic conditions is well established. A highly purified specimen of zinc is almost inactive towards acids, whilst commercial zinc, containing lead, is rapidly attacked, the action of the liquid beginning in the immediate neighborhood of the lead particles. This is one of a large class of similar facts, the bearing of which on the question of corrosion is often overlooked.

Physical Condition and its Effects

Laboratory tests of long duration or rapid tests involving the use on the one hand of active chemical corroding agents, or on the other of an applied electromotive force, are usually of an unsatisfactory character. A number of metals or alloys, arranged in order of their resistance to acid solutions, will present a very different order when exposed to technical conditions such as contact with city air or sea water.

The heterogeneity which gives rise to the formation of local couples may be of two kinds, chemical or physical. A pure metal is of necessity chemically homogeneous in the sense that it is made up of only one kind of atoms, but it may be physically heterogeneous. A metal which has been "cold worked" or deformed at a temperature below that at which complete recrystallization takes place, contains, as demonstrated by Dr. Beilby, films of amorphous material between the separate crystal grains.

The amorphous metal is more electropositive than the crystalline, as is shown by measuring the difference of potential between two specimens of the same metal in the cold-worked and annealed states respectively. Consequently cold-rolled metals almost always corrode in such a way that greater chemical action takes place along certain lines than along others, such lines following the direction of the rolling. This effect is not to be confused with the striation observed on the surface of rolled plates due to the inclusion of impurities.

Effect of Cold Rolling

There are two reasons for the greater corrodibility of cold rolled than of annealed metals; the more electro-positive character of the former and their greater heterogeneity. Against this must be set the fact that some metals are commonly porous in the cast or annealed state, and that the closing of the surface pores by cold rolling may increase the resistance to corrosion, in some cases more than compensating in this way for the electrochemical difference. This applies mainly to atmospheric corrosion; in contact with liquids the electrochemical differences assert themselves more strongly.

Local cold-working greatly accelerates corrosion. The severely cold-worked condition which prevails around a punched hole is always the spot at which corrosion first appears if opportunity offers.

Besides the physical condition of the metal, that of the product of corrosion has to be taken into account. When iron rusts, the product is porous and bulky. It affords a ready passage to the corroding liquids or vapors, whilst at the same time, being strongly electro-negative to iron, the ferric oxide furnishes innumerable local couples which accelerate corrosion. On the other hand the layer of oxide formed on aluminum under normal conditions is extremely tough and coherent, and prevents further corrosion when a certain small thickness has been reached. Where corrosion is more rapid the coating may be porous.

In moist, tropical climates aluminum corrodes more rapidly, and the coating, although apparently continuous, may be minutely porous. Aluminum drinking vessels in hot climates acquire a foul taste, doubtless owing to the absorptive properties of this porous coating of oxide.

Different Kinds of Corrosion

The term corrosion is used somewhat widely, but generally speaking may be taken to indicate the solution or oxidation of the pure metal or its constituents. There are three principal types, and these are not to be regarded as isolated or independant, rather are they extreme cases of an almost infinite variety of reactions, dependent upon the composition of the metal and the nature of the corroding influence. Type one, solution in acids, need not occupy our attention at this time.

Type two, graphitization.—This is the form of corrosion to which cast iron is particularly liable, the mass becoming so soft as to be readily cut with a steel knife. The metallic portion is more or less completely oxidized, mainly to ferrous oxide, some of which has frequently been washed away, the remainder collecting within the pores of the now isolated mass of graphite.

Type three, formation of rust.—The most usual form of corrosion is that in which the iron is oxidized more or less completely to brown, hydrated ferric oxide, which remains *in situ* and is popularly known as rust. When relatively pure iron is suspended in tap water, the ensuing rust consists almost entirely of hydrated ferric oxide, and there is usually no pitting. If on the other hand the metal is allowed to become alternately wet and dry, both ferric and ferrous oxides are produced, the proportion of the former varying enormously according to circumstances. In this case pitting is frequent.

When iron is only partially immersed in water the corrosion just at the surface of the latter is particularly severe, and the resulting mass of rust is usually high in ferrous oxide. Complete immersion of the iron in concentrated solutions of nitrates of the alkali metals may be made to yield a deep green oxide, while a dilute solution of oxalic acid develops a beautiful lemon-yellow form of rust. Dilute phosphate solutions may yield a white rust, whilst alkaline iodides can be made to yield black rust.

Influence of Composition Upon the Corrosion of Steel

Rusting occurs in all known steels to some extent when submitted to test with an appropriate medium. Ordinary rusting is slightly retarded by the presence of 3 per cent. tungsten in the steel, while in salt water the corrosion is increased. Vanadium has practically no effect on the corrodibility of steel. Chromium decreases the tendency to rust with steels of varying carbon content.

Nickel decreases corrosion when at least 3 per cent. nickel is present except in rare cases where the percentage of carbon present evidently exerts an influence favoring corrosion. Manganese steels are very irregular in their behaviour, generally speaking manganese causes increased corrosion of steel when the latter is suspended in water.

Changing the crystalline structure of steel by annealing, hardening, and burning causes the amount of corrosion to vary. In electrolytic corrosion this amount of corrosion per ampere hour of the hardened steel is considerably less than that of annealed or burned steel.

Recent experiments indicate that electrolytic corrosion produced by the flow of a current of moderate density from an external source produces results on the metal which are similar to those produced by corrosion under ordinary conditions.

In many, if not all cases, the character and rapidity of ordinary corrosion of iron and steel depend upon their physical and chemical properties, and the galvanic action due to differences in potential between different parts of the metal.

The Effect of Strain

The application of stress to metals causes an increase in chemical activity, this increase being especially marked after the elastic limit is reached. In cast iron and steel, in their many processes of manufacture, there are many irregular zones of density and purity, each of which has its own potential. Between all of these differently charged bodies a current of electricity is set up, the circuit being completed through the electrolyte.

This electric current flowing from the metal to the electrolyte will cause corrosion of the metal, which may be general over the surface of it, or be localized in spots, according to the composition of the metal, which is affected by local disturbances, such as welds, strains, annealing, burning, and hardening, or the presence of foreign substances. Some peculiar cases of corrosion can be explained by ascertaining if the metal has been subjected to some of these influences, that otherwise would be classed as mysterious.

Hardened steel being necessarily under a highly strained condition should show greater corrodibility than annealed or burned steel. If it does not, it is owing to the fact that the high tension between the particles holds them in place until they are severely corroded away.

Metals which do not change their physical characteristics when strained apparently do not materially change in corrodibility as the result of strain, though the very softest iron does harden slightly when strained and its corrodibility is slightly affected by strain.

QUESTIONS AND ANSWERS

Question.—Please publish a formula for solution which will produce a variety of colors on metal surfaces without the use of electric current.

Answer.—Dissolve 18 2/3 ounces sodium thiosulphate in one gallon warm water and add a solution of 7 1/3 ounces lead acetate in 8 ounces of water.

Place the metal to be colored in the solution and gradually raise the temperature of the latter by use of gas or coal fire underneath the container. As the temperature of solution increases, the tendency to develop color films becomes noticeable. Best and more rapid results are obtained at or near 212° F. Iron is given the color of blue steel. Zinc becomes bronze colored. Copper and brass acquire colors ranging successively from yellow to red, scarlet, deep blue, blue, light blue.

By substituting copper sulphate for the lead acetate in the preparation of the solution, brass will acquire following colors: First a rose tint, then green and finally an iridescent brown color. These colors must be protected by a coating of good transparent lacquer.

Question.—Our plating dynamo has been troubling us for some time by becoming very hot, the brushes pick up copper from the commutator and pitting results, some of the commutator bars are black. Kindly let us know how to overcome these conditions. What lubricant should be used on the commutator?

Answer.—Difficulties such as you mention may result from several causes. We believe your trouble is the result of faulty adjustment of brushes. The brushes may be in a wrong position, which always causes excessive sparking, or they may bear too heavily on the commutator. The pitting of the commutator surface may be due to high current densities, caused by the contact surface of the brushes being too small, or the contact itself being poor. The blackening of a commutator denotes sparking underneath the brushes, which in combination with excessive amounts of oil and dust will be the most valid cause of the blackening. In forming the above opinion of your difficulties we assume the armature and field coils are not defective. Frequent cases of commutator trouble originate from these sources.

Cleanliness is the main point in care of commutators. The surface should be kept free from dust and excessive amounts of oil. The brushes should have good contact with commutator, without bearing too hard on it. Use as little lubrication as possible and when used it should be acid free oil or vaseline. Trotter's compound is a very popular lubricant.

Commutator sparking may be classified into three forms, namely: Static; scintillating; greenish-yellow.

Static or small bluish white sparks are not considered very harmful, they only produce a slight heating effect. The scintillating sparking is caused by dirt and only occurs in very severe cases. The greenish-yellow sparking is the dangerous form of sparking on account of the heating and destructive nature. In such cases every effort should be made to locate the trouble and remove it as quickly as possible, because the longer it is delayed the more trouble will be experienced in restoring perfect conditions. Test your machine for a ground. A ground will overload the machine, thus causing excessive current to flow, and excessive current causes sparking.

Question.—After reading some of the suggestions for effecting economy in the polishing and plating departments, which have appeared lately in CANADIAN FOUNDRYMAN, I have been searching for weak spots in our plant. Among other things I found an accumulation of buffing compound which has become slack and unfit for use in buffing . Can we use this material for any practical purpose?

Answer.—If you employ tumbling process for finishing plated surfaces or small pieces we would suggest using small quantities of the compound with either leather meal or small cuttings of old buffs and fine saw-dust. If the mixture is slightly moistened with oil the results will be more rapid and improved.

ACCIDENTS ON OVERHEAD TRAVELING-CRANE RUNWAYS

ENGINEERS and designers have devoted a great deal of effort to the design and construction of cranes with the idea of producing machines that are both efficient and safe, and while their work has materially reduced the hazards in crane operation there are still a great many accidents that result from the daily use of equipment of this kind. This fact is easily demonstrated by the accident reports from plants equipped with the latest types of cranes and safeguards, and the trouble can be largely attributed to the "human element" which must always be considered. Accident prevention in the case of cranes must rest to a certain extent with the workmen, and they should protect themselves by taking every possible precaution.

Most users of cranes are familiar with the causes of the commoner accidents and provide the necessary safeguards for such, but some of the rarer and less obvious causes are equally important, although because of their seeming improbability they are usually lost sight of or are neglected. Discussing these less frequent accidents, the *Travelers' Standard*, in a recent article, considers the most common cause of accidents on crane runways.

Most of the commoner accidents that are likely to occur in the use and operation of cranes have been discussed in previous issues of that publication, but some of the rare ones are equally important. It is only natural to properly safeguard those places or machines which are productive of frequent accidents, but those in connection with which accidents are seemingly improbable are usually lost sight of, or are neglected. In this article, it is our purpose to call attention to some of these more or less infrequent accidents which occur in crane work.

Possibly the most common cause of accidents on crane runways consists in men working on the runways without taking sufficient precautions for their own safety. This trouble was not considered serious with the older type of noisy steam crane which gave plenty of warning of its approach, but the introduction of electric cranes has altered this condition. Workmen are quite often run down or knocked off the runway by the crane bridge or trucks.

At first thought, it would seem that the crane operator would be able to safeguard workmen on runways from these dangers. But his entire attention is required in watching the load and observing the floorman below for signals, and as a result he can give little heed to the conditions on the runway. Even if the workmen were thoughtful enough to advise the craneman of their intention to work on the runway, it is easily possible for him to forget their presence, or he may misjudge the speed or distance and so run the crane against them.

One way of eliminating such dangers is to discourage as much as possible the unnecessary use of crane runways by the workmen. The runway should not be used as a walk for carrying parts, tools, and other objects needed for the repair of a crane. In making repairs or additions to old equipment, or in the installation of new equipment, the use of a portion of the runway as a place to stand or walk should not be allowed, if it is possible to do the work in some other way, even though some inconvenience may be caused. Do not use the runway in climbing from one part of the building to another. If these precautions were heeded a great many of the difficulties would be overcome. Occasionally, of course, men must be upon the runway,—as for example, in the repair of the runway itself, which would require the service of the men on or near this source of danger. At such times other means of protection would have to be sought.

The safest practice would be to stop all operations of the crane, anchoring it or blocking it so that it cannot move. This, however, does not meet with general favor because the importance of the work for which the runway was being used might hardly warrant a shut-down. Therefore, when a man is obliged to work on a runway he should first of all notify the craneman. A warning flag should be hung from a near-by column in plain sight of the craneman; or track torpedoes, placed on the rails at suitable locations, may be used for the same purpose. In addition to the use of danger flags or torpedoes, portable rail stops or buffers should be clamped to the crane rails a few yards from the point where the runway is being used. This procedure will isolate that section of the runway on whics acidents might occur, and if the crane operator forgets the man on the runway, or fails to note the warning flag or the torpedo, the buffers will insure the safety of the workmen.

Track stops or buffers, although strongly recommended as a means of protection, are often cast aside. If they are supplied, they are often at some inconvenient place, or their whereabouts are unknown. The men frequently object to them, too, on the ground that time and labor are required to install and remove them. Often workmen who are to be on the runway only a short time would rather go unprotected than take the trouble to attach the buffers. These conditions should be improved, and in case the buffers are not supplied, the workmen should have a stout rope safely fastened in some convenient place, so that they may easily slip down to the floor in case of danger.

The electrical hazards which may be encountered by workmen upon runways are very serious as the trolley wires are necessarily uninsulated, and the voltage carried is comparatively high. Under these conditions there is not only the possibility that men may be electrocuted, but also that they may fall from the runway as a result of slight electrical shocks. If for any reason workmen are required to use any part of the runway where this danger is present, the power to the trolley should be effectively disconnected by means of a safety switch provided with a locking device so that the current cannot be turned on again until the workmen are safely away.

In addition to substantial stops or buffers secured at the extreme ends of all runways to prevent the crane from leaving the track at these points, each runway should be provided with a suitable and substantial walk, properly guarded by railings and toe-boards, extending along its entire length on the motor side. A walk of this kind should be at least 6½ feet below the bottom of the overhead trusses. This addition, which may not be feasible on some existing installations, should be provided for all new runways. Such a walk would offer a safe retreat for workmen, and would be found convenient in making various repairs to the crane itself.

The failure of crane supports may be due to several causes which would include abuse, lack of attention, overloading, and inferior design, material, or workmanship. While each one of these causes may be, in itself, capable of producing a mishap, crane failures, like accidents of many other types, are not necessarily due to any one single cause, but to a series or combination of causes, all tending to a common end. It is for this reason that a great many failures cannot be satisfactorily explained. The following account of an accident will serve to illustrate this fact.

The accident occurred in a shop doing general foundry work. The building in which the castings were poured was adjacent to the yard in which the heavy flasks and castings were stored, so that the crane runway, which extended into the yard, served both for the building and the yard. Two cranes were used, and at the time of the accident one crane had just delivered its load to the yard and was standing on the outside runway. The second crane, with its load, had just come out of the building and was preparing to lower its load to the yard. Due to some cause, the runway under the second crane began to give way. This made a depression into which the first crane rolled. The additional stress at the defective point caused the collapse of the runway, and both cranes dropped into the yard, taking with them practically all of the outside structure.

No satisfactory explanation of the failure was ever made. Some said that the second craneman "plugged" or suddenly stopped his motor, producing such an exceptional stress that the runway was broken down. Others thought it was due to an eccentric loading on the columns which failed.

The runway had been in service for about ten years, and the bases of the columns were badly rusted, especially where they rested on their foundations. It was said that the outside runway swayed quite perceptibly when the crane was in operation. In all probability a failure of this kind would be due to a combination of causes; and in order to prevent other similar accidents it would be necessary to take special precautions to eliminate each of the various possible causes.

Defective material, inferior workmanship, and poor design are usually not serious hazards in our present day manufacturing methods. Rigid specifications and practical designs, accompanied by thorough inspection and tests of the materials during manufacture and erection, have practically eliminated all dangers from these sources. It is true that this will not always hold good, but the spirit of honesty in our American manufacturing methods has resulted in the production of exceptionally reliable products. Accidents from the failure of members of a structure are nearly always produced by other causes.

The crane runway is designed to carry certain specified loads, and if its safe capacity is exceeded some of the members may break, causing serious damage. The safe allowable load of the crane should be plainly marked on both sides, using figures large enough to be seen and read from the floor. While this is intended to prevent overloading of the crane itself, it will also tend indirectly to protect the crane runway. When two or more cranes are used on the same runway, it is never good practice to bring these cranes, if loaded, too near each other. This concentrates the weight, and may overload the runway in case it is not designed for such conditions. This precaution would be especially desirable where the original equipment consisted of but one crane, and where, because of increased demands, additional cranes were installed to operate on the original runway.

The proper care in the handling of the loads is a point that is quite frequently neglected by cranemen. When loads are suddenly stopped or started, or are carried in a jerky, swinging manner, an excessive strain is exerted upon the crane which in turn transmits it to the runway. Such conditions may easily cause strains equal to double the weight of the load that is being carried, and under conditions of extreme shock would cause the stresses to be increased indefinitely. Careful operators may easily overcome these dangers by properly adjusting the load, using care in taking up the slack of the slings and hoisting cables, in starting and stopping the crane gradually (not "plugging" or reversing the motor to produce a sudden stop), and in preventing the load from swinging.

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AN item of interest to those engaged in the manufacture or use of quick-drying varnishes is the increasing use of tung oil, a product of the Chinese wood oil tree. When four or five years old the tree commences to bear fruit which are about the size of small apples and which contain from two to eight large oily seeds. It it from these seeds, which are said to be poisonous, and which are not to be eaten, that one of the best drying oils, wood or tung oil, is extracted. In recent years the use of this oil has become so great that it has revolutionized the varnish-making industry of the United States, for with it the manufacture of a quick-drying varnish, less liable to crack than that made from kauri gum, is made possible. Tung oil has also been found of special value in the making of waterproofing cement.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	$50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 62 00
Antimony	18 00
Copper, lake	32 00
Copper, electrolytic	32 00
Copper, casting	31 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 20
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 38
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 78
Linseed oil, boiled, single bbls.	1 42
Linseed oil, raw, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A....list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 15
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 9 50	$ 9 00
Sheets, black, No. 10.	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard buishings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 50%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to $0.54
Cobalt	1.75 to 2.00
Copper	.36 to .38
Tin	.86 to .88
Silver, per oz.	1.05 to 1.00
Zinc	.14 to .16

Prices per lb.

NAILS AND SPICES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails	60%	

PLATING CHEMICALS.

Acid, boracic	$ .20
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.08
Ammonium, chloride	.11
Ammonium, hydrosulphuret.	.40
Ammonium, sulphate	.07
Arsenic, white	.10
Caustic soda	.07
Copper, carbonate, anhy	.50
Copper, sulphate	.16
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate .....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.46
Sodium cyanide, 98-100%	.38
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, singl and double	30 5%
Standard	40%
Cut leather lacing, No. 1	1.[illegible]5
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.		$3 25
Polishing wheels, bullneck		2 00
Pumice, ground		07
Emery composition	10 to	12
Tripoli composition	06 to	09
Crocus composition	08 to	12
Rouge, powder	.30 to	.35
Rouge, silver	.50 to	.55

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd.	0 43
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 55
Copper tubing, seamless	0 60

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

The General Market Conditions and Tendencies

TORONTO, Ont., March 5.—The outlook in manufacturing circles this year looks decidedly promising, particularly in regard to shipbuilding and munitions. Under the Dominion Government programme all berths as they become vacant will be used for Government ships, and it is hoped that tonnage laid down this year will be in the neighborhood of 400,000, providing, of course, that a sufficient supply of men and materials are available. In this connection there will be a good demand for ship machinery and fittings of all kinds. It appears probable that there will also be considerable activity in the munitions industry. There is a probability of further contracts for munitions being placed with Canadian firms by the American Government.

Iron and Steel

The general situation in the iron and steel trade is gradually improving, but business is being interfered with by delays incidental to the necessity of obtaining shipping permits, and also because of the freight congestion. The permit situation, while being necessary, due to conditions arising out of the war, is nevertheless a handicap in the efficient conduct of business. No iron or steel can be moved either from mill or warehouse without permission from Ottawa, and, of course, no material of any sort or description can be shipped from the States without authority from Washington. There is consequently considerable delay in getting material shipped from this reason alone. Traffic conditions have improved on account of the more favorable weather, but the shortage of cars continues to be the most important factor in the situation, and it will be some time before any material relief can be looked for. Merchants report steel business as being fairly good in connection with non-war industries, but are hampered owing to the unusual conditions prevailing in the trade. There have been no price changes this week, and the market continues firm.

Operating conditions are steadily improving and production is increasing as a result. The improvement should be progressive now that the worst part of the winter has passed, and conditions soon be normal. There will be a feeling of relief as well as satisfaction when production reaches capacity, as steel is badly needed for war work as well as for the so-called non-essential industries. The Dominion Government is understood to be getting all the plates required for the first lot of ships that are being laid down under the Government programme. The material is being obtained direct through the War Purchasing Commission. The sheet mill which the Steel Company of Canada has installed at Hamilton is operating successfully, with an output at the rate of 20,000 tons of sheets per year. The quality of the sheets is said to be quite satisfactory, comparing very favorably with the best brands from England or the United States.

The leading steel manufacturers in the United States are agitating for an increase in the new schedule of prices, which will go into effect on April 1. Increasing costs and alleged unprofitable contracts will, it is thought, result in the manufacturers' committee advising the War Industries Board that a scaling upward in prices would be warranted for the new period of fixed prices to prevail after March 31. The prevailing prices on steel products became effective on September 24 last, and were reaffirmed on January 1. The steel market awaits with the greatest interest the decision on fixed prices, and it is hoped that the Government will make the next term extend from six to nine months, as it is believed such action will encourage more confident buying by domestic consumers.

Scrap

There is no change to report in the scrap market, trade still being dull and prices unchanged, except for No. 1 machine composition, which has advanced on account of the shortage of tin. Consumers still hold to the belief that prices will come down, and because of this they are not buying except hand-to-mouth to satisfy immediate requirements. The freight situation was improving until an embargo practically stopped the movement of material.

Machine Tools

The machine tool market continues quiet, business consisting principally of single tools for munitions plants and heavier machines for shipyards. In regard to the latter there is a fair demand for second-hand equipment. The Dominion Shipbuilding Co. is buying equipment for the new plant on the harbor front. The Curtis Aeroplanes and Motor Co. has taken over the Toronto Furniture Co.'s factory on Dufferin Street and will instal equipment for manufacturing aeroplanes. The Russell Motor Co. are said to have secured a contract for fuse parts from the American Government. It is understood that further orders for munitions are being placed with Canadian manufacturers by the American Government and increased activity is looked for as a result of these orders. It is reported that orders for larger shells than the 75 M.M. will be placed in Canada.

Supplies

Prices of machine shop and mill supplies are holding steady and firm, while dealers report a satisfactory volume of business. Deliveries of goods manufactured in the States are rather backward, but on lines made in Canada the situation in this respect is improving. New net list prices have been issued on wrought pipe, which provides for higher prices on certain styles of pipe. Standard buttweld and standard lapweld pipe remain unchanged in price. Standard lapweld genuine wrought iron pipe, S/C, shows an advance on sizes 4½ in. to 8 in., both black and galvanized, while extra strong genuine wrought iron pipe, P.E., shows an increase in price in sizes 4½ in. to 8 in. The United States Government has placed an embargo on shipment of higher grades of all refined oils. This provision is not likely seriously to affect the Canadian market. The higher grades of coal oil, such as "Palacine," are practically the only lines to be affected. Compared with amount of other grades of coal oil used there are very small quantities of this class of oil in use. The particular grade noted is refined from Pennsylvania crude. The market for gasoline is holding steady. Mid-continent crude oil has not yet registered an advance, and there is now an accumulation of stock of gasoline on this continent due to lack of tonnage to carry commodity overseas. Gasoline is quoted at 31½c per gallon.

Metals

The outstanding feature of the week in the non-ferrous metal market has been a sharp advance in tin, due to the acute shortage and great difficulty that is being experienced in obtaining supplies of this metal. There is no change in the copper situation at present, although it is not unlikely that the price will be advanced in the States in line with rising producing costs. Spelter is firmer and a shade higher and solders have also advanced, due to the high cost of tin. There is nothing of particular interest to note in regard to the other metals, and prices are unchanged.

Copper.—The growing demand for copper for Government work indicates a diminished supply for other consumers, although it is believed that there will be sufficient supplies to meet all requirements. It is now more generally believed that the United States Government will allow 25c as the new fixed price for copper when the present agreement expires on June 1. It is estimated that the advance of 1½c will cover the increased production costs. The producers have been agitating for a 25c price for some time. The local situation is unchanged, lake and electrolytic being quoted at 29c and casting at 28c per pound.

Tin.—The tin situation is getting more acute and as a result of the great scarcity prices are steadily advanced. The small quantities of tin that are coming in are snapped up, principally for Government work, and many consumers cannot yet buy metal at all. Tin is allowed to come to consignees in Canada from England, but a permit must first be obtained from Ottawa in order to control the ultimate destination of all shipments. Tin has advanced 15c, and is now quoted nominally at $1 per pound.

Spelter.—Prices are a shade higher locally, but the market is dull and featureless. The consuming demand is light and considerably below the producing capacity. Local price is now 10c per pound.

Lead.—The market continues firm, with a higher tendency. There is some scarcity of lead in the primary market, which has placed the metal in a strong position, and an advance is not unlikely. The trust price is 7.25c New York for spot lead. Local price, 9c per pound.

Antimony. — The market continues quiet, with a lower tendency. Available supplies are sufficient to meet the demand. Local price, 17c per pound.

Aluminum.—The market is firmer on account of heavier demand, but quotations are unchanged in the meantime at 52c per pound. The price of aluminum in the States has been fixed at 32c per pound.

Solders.—Due to strong market for tin there has been a continued strong market for solder, and prices have advanced. Guaranteed is now quoted at a range of 47c to 48c per pound; strictly at 44c to 45c. Demand for solder is reported active, buying evidently being stimulated by the upward trend of prices.

Foundry Supplies

There is little change to note in the situation as it affects foundry equipment and supplies. The decline in reduction during the past two months has created a more acute shortage of raw materials, although it has not affected prices. Available supplies of pig iron and steel are being diverted to plants engaged on war work, leaving the so-called non-essential industries bare of materials. Conditions in this respect, however, are not so severe, and indications point to a considerable improvement in the near future. The steel foundry trade is very active, but iron foundries are not so fortunate, although generally speaking it cannot be said that business is by any means dull.

TRADE GOSSIP

Marsh & Henthorn Ltd., of Belleville, Ont., announce that the title of the concern has been changed to the Marsh Engineering Works Ltd.

Port Moody, B.C.—The Aetna Steel Works is installing a new 6-ton electric furnace this month, equipment for which now is going forward.

Vancouver, B.C. — The G.T.P. tug Lorne, recently purchased and refitted, has left for the North to inaugurate the company's transfer barge service out of Prince Rupert.

Sidney J. Jennings, vice-president of the U. S. Smelting, Refining and Mining Co., has been elected president of the American Institute of Mining Engineers.

Winipeg, Man.—The Central Tools & Forgings Ltd., has opened its plant for the manufacture of high grade tools and forgings, such as chisels, punches, subsidiary tool steel lines, track tools, blacksmith supplies, etc.

Hamilton, Ont.—The United Gas & Fuel Co. has again approached the City Council in connection with the scheme for installing a coke oven plant. It is estimated that the cost would be over $3,000,000.

Port Colborne, Ont.—The Canadian Furnace Co. had their second ore bridge blown down in the storm last week, the damage being estimated at $100,000. The other ore bridge was blown down last year, and is now being rebuilt.

Aurora Foundries Ltd., have been incorporated at Toronto with a capital of $40,000 to manufacture iron, steel, and brass castings of all kinds at Aurora, Ont. The provisional directors are R. A. Fraser, R. H. Noble, and G. W. Johnson, all of Toronto.

Metals Chemical Ltd. has been incorporated at Toronto with a capital of $1,000,000 to manufacture all kinds of chemicals, compounds and to carry on a mining and smelting business at Welland, Ont. The provisional directors are A. W. Holmested, J. L. Ross and W. J. Cluff all of Toronto.

Capt. James Young, who went overseas as second in command of the 1st Reinforcing Company, 5th Royal Highlanders, has been wounded in the head and hand, but is doing well. Before enlisting, Capt. Young was employed as manager of the Montreal office for John Bertram & Sons, Ltd., and of the Pratt & Whitney Co. of Canada.

Three Rivers, Que.—Arrangements are under way here, it is understood, for the erection of a $1,000,000 steel plant in this city. The Page Wire Fence Co. of Canada, Walkerville, Ont., which has lately been incorporated with a capital stock of $250,000, is carrying out the undertaking. Montreal capital is said to be largely interested, and the object is to manufacture iron and steel products and ingots.

Ross H. McMaster, assistant general manager of the Steel Co. of Canada, will join the Canadian War Board at Washington, which is being organized by Lloyd Harris to handle Canada's business with United States until the close of the war. Mr. McMaster was connected with the management of the Montreal Rolling Mills prior to the inclusion of that plant in the Hamilton steel combination. He is a director of the Bank of Montreal.

The Canadian S.K.F. Co., of Toronto, announce that they have opened an office in the Board of Trade Building, Montreal, under the direction of Harold Brown, to take care of their expanding business in that district, and also to give a more direct service to users of S. K. F. bearings. Mr. Brown was previously the manager of the J. Stone & Co., in Transportation Building, Montreal, who handle the Stone railway lighting system.

Locomotive Building Steel Requirements.—Locomotive builders in Canada and the United States will require about 76,000 tons of forged rolled and cast steel for the building of 383 locomotives, orders for which have been taken since the first of the year. The largest contracts have been placed with the American Locomotive Co., while the Montreal Locomotive Works and the Canadian Locomotive Co. have also secured important contracts.

Bridgeburg, Ont.—The first steel for the four ships to be built at the yard of the Canadian Allis-Chalmers Co. at Bridgeburg, Ont., has arrived. Practically all the machinery is at hand and is being installed rapidly. It is expected that all four ships will be launched in less than a year. The ships will be of the standard 2,500-ton design of the British Admiralty, 260 feet long over all, just short enough to get through the Welland Canal. The steel comes from the United States as the result of an arrangement made for its import by the Ottawa and Washington Government last month.

Victoria, B.C. — British Columbia's campaign for the establishment of steel mills and government assistance in developing her vast iron reserves secured more momentum when a mass meeting, addressed by representatives from the island and mainland, was held here recently. Resolutions were passed calling for co-operation between the provincial and federal governments, and for giving the provincial minister of mines additional power in expropriating mine property in British Columbia, and also urging the British Columbia Government to appoint independent experts to make an investigation and report on the situation.

Canada Copper Corporation Developments.—The Canada Copper Corporation is reported to be speeding the advance of the tunnel which is to become the avenue of development as well as for removal of copper-bearing ore. General Manager Lachmund stated that the tunnel will tap the ore at a depth of 1,000 feet below the highest outcrop. Operations were started on Oct. 10, 1917. The total length of the tunnel on Jan. 31 last was 2,067 feet, and the total length timbered was 200 feet. The dimensions of the tunnel are 9 by 11 feet. The average rate of advance was 18 1/3 feet a day.

Secret of the Crucible.—Another blow to German manufacturers was disclosed in London at the Society of Arts, when Prof. C. R. Darling, expounding high temperature processes and their products, said that the crucibles used had to be lined with special material in order to withstand so great a heat as 3,000 degrees. Formerly all the necessary metals used were produced in Germany and imported, but since the war, owing to the research of our scientists, we had become independent of them. As the result of experiments, 30 metals and alloys of a very useful character were now manufactured in this country.

New Stainless Steel on Market.—A new metal known by the registered name of Bario has been put upon the market by the Bario Metal Corporation, New York, as a heat and acid-resisting material. The manufacturers claim that this is the only commercial metal of its kind that does not rust, tarnish, corrode or deteriorate. It is, they state, non-magnetic and remains clean and bright and is not attacked by sulphuric, nitric or muriatic acids, resembling in this respect gold and platinum. The melting point of Bario is high, beginning at 3,100 deg. Fahr. and increasing according to the grade of metal mixture used. It is manufactured in nine different grades.

Vancouver, B.C.—The formation of a $300,000 company to construct a blast furnace in or near Vancouver to test commercially the iron ores and coke of the British Columbia coast, and to produce a supply of pig iron for local markets, is a project which Hugh McLean is now placing before municipal councils, boards of trade and other public organizations of Greater Vancouver. Mr. McLean believes that such a blast furnace would prove a profitable investment. He suggests that it would also be a big step towards the establishment of an iron and steel plant. His proposal is that the Provincial Government and the Federal Government each subscribe $100,000, and that the remaining $100,000 be provided by business men of Greater Vancouver.

IN a recent paper read before the American Institution of Chemical Engineers, Cleveland, by Mr. W. C. Carnell, some interesting facts were given regarding the use of ferro-chrome and silicon iron alloys in the manufacture of acids. Ferro-chrome is almost entirely unaffected by the action of sulphuric or nitric acids, weak or strong, or by glacial acetic acid, but is readily attached by hydrochloric acid. The chief silicon-iron alloys which resist the action of weak or strong nitric or sulphuric acids are "tantiron," "duriron," and "ironac."

The composition and physical properties of tantiron are as follows: Si. 14 to 15; Mn, 2 to 2.75; C (graphite), 0.75 to 1.25; S, 0.05 to 0.15; P, 0.05 to 0.01 per cent.; density, 6.8; melting point, 2,550 deg. Fah.; tensile strength 6 to 7 tons per sq. in. Tantiron will not withstand high internal pressures without

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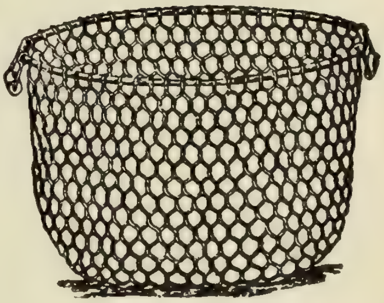

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strengthening. Duriron consists of Si, 14 to 14.5; C (total), 0.2 to 0.6; Mn, 0.25 to 0.35; P, 0.16 to 0.2; S, under 0.5 per cent.; density, 7.0; melting point, 2,500 to 2,550 deg. Fah.; compression strength 70,000 lb. per sq. in.; tensile strength is 25 per cent. less than cast iron.

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SOUTH AFRICA'S IRON AND STEEL INDUSTRY

IT is quite conceivable that, before many years have elapsed, Pretoria will develop into a great industrial centre for the production of iron and steel, and become a "Sheffield" in miniature. It has, of course, always been known that abundant deposits of iron ore of a quality which makes it extremely valuable from the commercial point of view exist in the Pretoria district; but it is only recently that the Corporation has taken the definite step of leasing to a local company a small portion of the ore-bearing area.

The company in question has been promoted by Mr. C. F. Delfos, of the well-known engineering firm of Delfos, Ltd., Johannesburg and Pretoria, who are, of course experts in this branch of industry, and a blast furnace to treat the ore, as also that found near Barkly West, in the Cape Province, will shortly begin operations. Inquiries have, however, been received from other quarters and from other persons who desire to take a much larger share in the mining of iron in this region; but the municipality unfortunately finds itself handicapped by its inability, under the Local Authorities Land Ordinance of 1916, to grant leases of longer duration than 20 years.

Naturally, capitalists will not put up money for development of the ore bodies on a really wide and commercial scale until this ordinance has been materially modified. When that has been done, and the Corporation given the option of extending leases beyond the period of two decades, it is generally believed that there will be a great influx of capital to the district, and that industrial activity will manifest itself not only in iron-mining, but the establishment of blast furnaces and other related enterprises on a large scale. It may come as a shock to the aesthetic who knows the spotless little capital city, sheltered in its shallow cup of hills, and would have it remain unchanged, but the iron is there, and in these days of relentless industrialism it is only natural that the smoke of the furnaces should follow rapidly upon the commencement of mining.

Chamber of Mines' Electric Furnace

The need of a "primary" iron and steel industry in South Africa hardly requires laboring. Professor John Orr is satisfied that the ore is there, just as we all know the coal is; and the reports made recently by other scientists after careful investigation of the town lands of Pretoria appear to put the matter beyond all doubt. The manufacture of steel has already taken place quite successfully in the Transvaal, even although the industry may be said to be still in the experimental stage. The first electric furnace of the inductive type to be erected in South Africa was set up a few months ago by the Witwatersrand Co-operative Smelting Works under the auspices of the Chamber of Mines for making steel castings, such as shoes and dies for the mines, from scrap metal; and, of course, the manufacture of bar iron, etc., from scrap in the Transvaal has been carried on at Vereeniging for several years, its production in 1916 having been 1,635 tons of light rails, 4,650 tons of ingots, 450 tons of structural steel, and 2,417 tons of merchant steel. This output should be enormously exceeded when last year's figures are available. Between 70 and 80 tons of shoes and dies are now being turned out per month by the electric furnace referred to, and, although the needs of the mines are very much in excess of this output, a very useful contribution is being made to current requirements.

The lining of the furnace at first presented some difficulties, but these were solved by the use of magnesite from the Eastern Transvaal, calcined in Johannesburg. Two linings per month proved adequate. The life of the local shoes and dies, we are informed, is from 70 to 100 per cent. of that of the imported, the difference being mainly attributable to the fact that the shoes and dies obtained from overseas are hammered, and to the further fact that owing to the war it is impossible to secure the export to South Africa of the plant necessary for doing this work. The locally-manufactured articles accordingly command a smaller price than the imported, viz., £25 per ton, as against £35.

Scrap Metal Supplies

At the Danswart Iron and Steel Works, Ltd., something like 400 to 500 tons of bars and angles are now being produced monthly from selected fagotted scrap. As will be noted, however, whether it is a case of making shoes and dies in Johannesburg or rails and ingots at Vereeniging, complete dependence has at present to be placed upon scrap metal; and we take it that South Africa's supplies of scrap are far from inexhaustible. If, therefore, the iron and steel industry of the Union is to establish itself on a permanent basis, it is highly essential that pig-iron should become available without unnecessary delay. The realization of this fact ought to expedite research and development work at Pretoria and other points, such as Kromdraai, at which, it is claimed, payable iron ore exists in large quantities. Sheffield steel masters are largely interested in the South African iron industry, and are, to our knowledge, watching developments with extreme vigilance.

LURE OF PERPETUAL MOTION

By R. M.

MANY of us are afflicted at some time in our career with the idea that perpetual motion is not only possible, but that we are probably the fortunate individual to discover the secret that has baffled scientific men for centuries. The lapse of normal consciousness, however, is seldom of long duration, as the majority soon realize that it is a practical impossibility to obtain "something for nothing," a condition that must necessarily exist for such a thing as perpetual motion to become an established fact. To secure motion, be it ever so small, it is essential to utilize a proportional amount of energy, so that to maintain the motion it is quite obvious that the power must be first generated; therefore, with a little thought, the fallacy of perpetual motion is readily acknowledged by anyone who will take the trouble to study, even briefly, the fundamentals underlying the mechanical sciences. However, advice in this connection will seldom be accepted by those who have once got the "bug," until they themselves are convinced to the contrary.

The writer himself is one of the many who have experienced the thrill of this visionary flight, but in a very short time had to admit that perpetual part of the task was in the seeking rather than in the achievement of the purpose. A temporary illness in this respect is often a good thing, but a prolonged sojourn from the more immediate and practical opportunities may prevent a man applying his ingenuity to a better and more remunerative cause.

Should a man ever become persuaded that perpetual motion is to be the product of his own particular brain, it would be well to obtain some data on the subject before expending any time experimenting, as in many books that have been published there is a more or less comprehensive treatise of those ideas that have encouraged men to spend weeks and months, and even years, of their lives in a vain effort to achieve a result that was expected to revolutionize the science of mechanical operations. A perusal of such literature may bring to light a duplicate of the very idea that has become the pet of their wakeful hours and the nightmare of their restless nights.

◆

GLUE IN PATTERN MAKING

ALTHOUGH both glue and putty are a nuisance to moulders if used in making up patterns, glue is indispensable. If ordinary joiners' glue is used, not only do the patterns come apart, but moulds cannot be produced without much trouble owing to the sand sticking to the patterns. For these reasons it is desirable to use a practically waterproof glue, and to clamp the glued portions of the pattern together as tightly as possible, so that any excess of glue shall be squeezed out, the object being to get as sound a joint as possible. Glued patterns should always be exceptionally well varnished, and should be kept varnished after use for very obvious reasons.

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Lloyd George

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COL. JOHN BAYNE MACLEAN contributes to the March issue of MACLEAN'S MAGAZINE a strong article dealing with the need for efficiency in the Lloyd George Government and giving interesting information with reference to the young man who is rapidly coming to the front in Imperial affairs—Sir Eric Geddes, the head of the Admiralty. This contribution is one of a notable series.

"SIXTEEN MONTHS IN GERMANY.

What a Canadian Prisoner saw and heard there—and how he escaped," By John Evans

This article presents a picture of conditions in Germany and gives many new facts with reference to what is going on in that country. The writer worked for sixteen months in the mines of Westphalia and came in close contact at all times with the miners. The story of his escape is a thrilling one.

"CANADIANS IN MESOPOTAMIA."

By a Canadian Medical Officer.

Little has been known heretofore of the campaign in Mesopotamia. This article gives details of the campaign and of the part which Canadians are taking in it. It shows how the inefficiency of the first campaign has been done away with and how splendidly organized the British army now is. The article contains many interesting anecdotes of adventure on that front.

"LABOR THE DOMINANT FACTOR."

By Agnes C. Laut.

This is an article on the war situation as it is developing on this side of the Atlantic, showing that labor is becoming a dominant factor. In the United States the antagonistic attitude of the labor union is dying out and being replaced by a strong desire to assist in war measures.

"CANADA'S NEW BOSS."

By H. F. Gadsby.

A political article, dealing with the "man behind" Union Government. It gives interesting and exclusive information with reference to the political situation at Ottawa as it is developing since the election.

"A CASUALTY."

By Robert W. Service.

A war poem which tells of an experience which actually happened to Service while driving a motor ambulance on the Western Front. It will be illustrated by C. W. Jefferys.

Fiction in the March Number

"BY THE TIP OF AN EYELASH," by A. C. Allenson, illustrated by R. M. Brinkerhoff. A bright story combining business, love and horse racing.

"THE GARDEN OF SPICES," by L. M. Montgomery, illustrated by F. Weston Taylor. This is a most unusual and charming love story.

Two long instalments of the two serials "THE PAWNS COUNT," by E. Phillips Oppenheim, and "THE MAGIC MAKERS," by Alan Sullivan.

"THE GIRL ON THE VERANDAH," by Arthur Beverly Baxter, who wrote "The Man Who Scoffed," and "Mam'selle Butterfly."

Regular Departments and Features

There are the regular features and departments: Review of Reviews; Business Outlook; The Investment Situation; The Nation's Business; Books; Women and Their Work. A food article by Miss Chapman is a feature, and a new Spring Department on Seeds and Garden Culture starts in this number.

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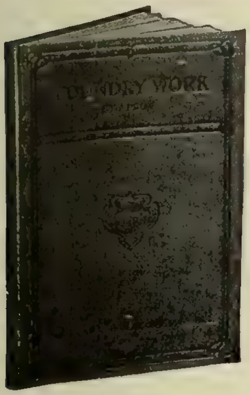

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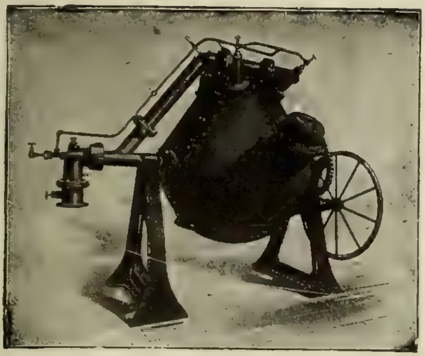

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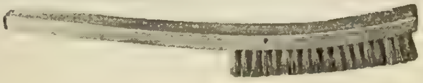

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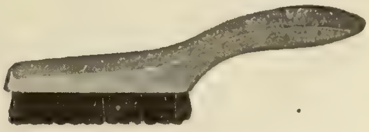

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ALWAYS associate with men who are earning more money than you are. Such is the advice given by a man whose name is known the world over for his own success and the business which he created. It is good advice of a certainty, but we are not urging that it is the best advice. At the same time it is wise to associate with better or bigger men than you are yourself, because you are likely to be lifted up to their levels.

Most of us would probably like to be the intimates of J. P. Morgan, or of John D, or of Charlie Schwab, or Canny Andrew. If we had a speaking acquaintance with John Wanamaker, or Lord Beaverbrook, or Lord Shaughnessy, and with other distinguished and successful men, we would take comfort from the fact.

And most of us would feel rather small and uncomfortable if we were placed beside President Woodrow Wilson at a dinner table, or beside Sir Robt. Borden, Sir Herbert Holt or Thomas Findley. And the reason would probably be that we know so little of the knowledge that really counts. If these great men engaged us in conversation we would probably find ourselves knowing very little about the things that matter.

This will illustrate the point:

Here's a true story. A Toronto manufacturer found himself on a train going to Albany in company with a number of distinguished Americans about to attend the inaugural ceremonies of a State Governor. A washout led to a delay, and the Canadian was thrown into close association with senators and congressmen and prominent lawyers. They bantered the little Canadian about Canada. He had the pluck of a bigger man. He had been a constant reader of THE FINANCIAL POST, and had absorbed many facts about Canada. He surprised his American traveling companions with his positive, well-informed and wide knowledge of Canada. When the company reached Albany, the Canadian was persuaded to attend the ceremonies, and was introduced as the man who knew all about Canada. The Governor was interested in Canada, and said so, and the little Canadian found himself telling the story of Canada very ardently to a very attentive listener, much to the amusement of his friends who introduced him.

This man made a hit on that journey, and many friends. One of the company gave him a stock market tip worth a fortune.

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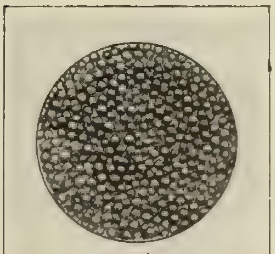

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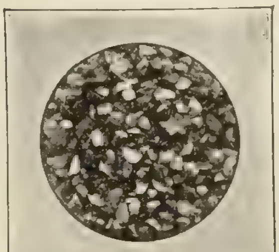

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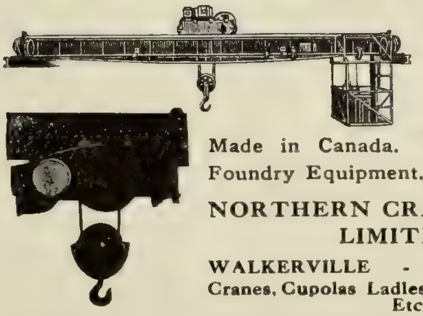

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CAR MOTORS
Can. Ingersoll-Rand Co., Montreal, Que.

CARS, CORE OVEN AND FOUNDRY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, ETC.
United Brass & Lead, Ltd., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
United Brass & Lead, Ltd., Toronto, Ont.
W. W. Wells, Toronto.

CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Fanner Mfg. Co., Cleveland, Ohio.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens,. Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Standard Equipment Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.

CLAMPS, FLASK
Obermayer Co., S., Chicago, Ill.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., T[illegible]
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

CRANES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

DYNAMOS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
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W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.

ELECTRO PLATING
United Brass & Lead, Ltd., Toronto, Ont.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS
Can. Fairbanks-Morse Co., Montreal, Que.

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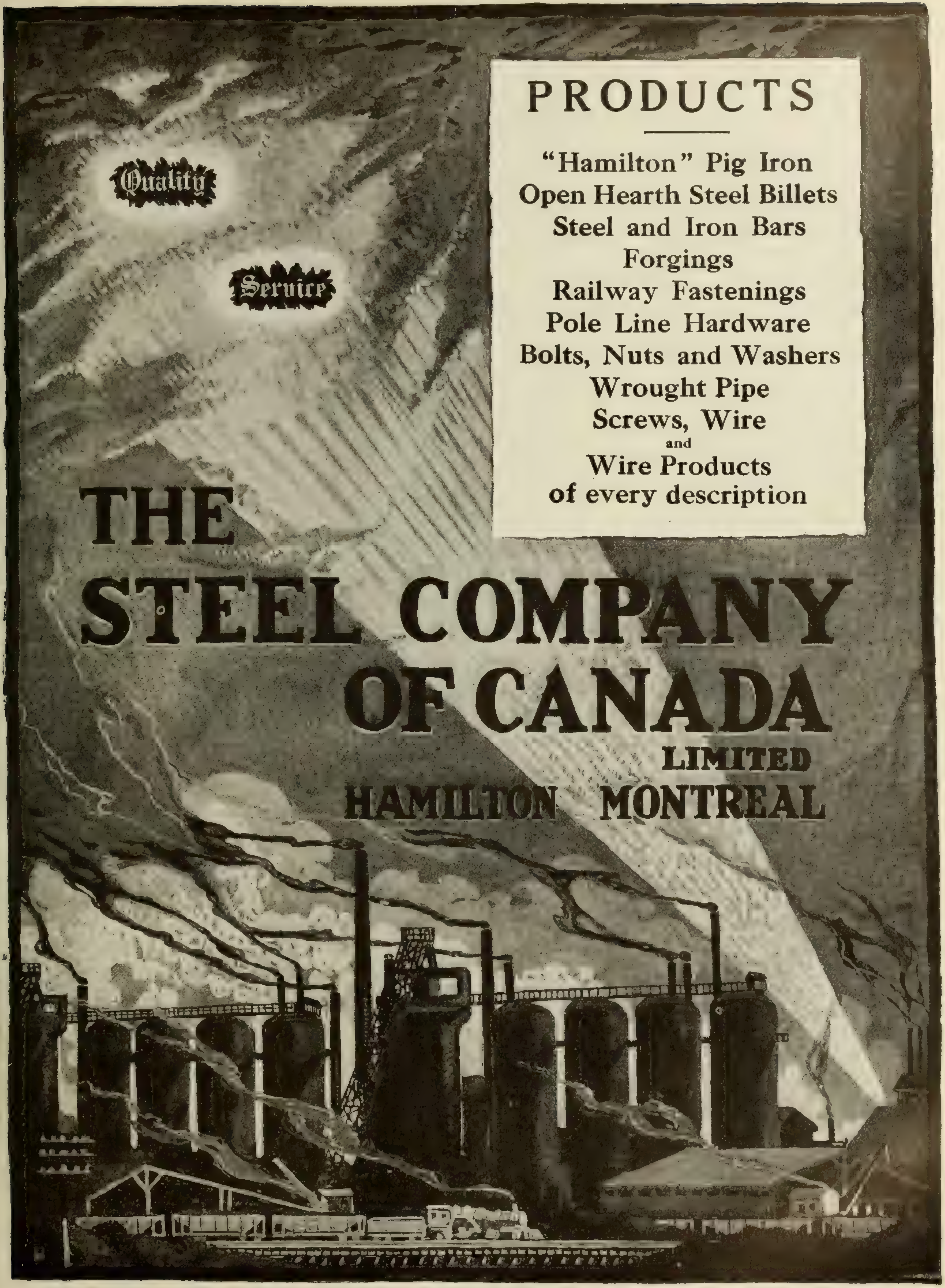
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.



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Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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U. S. Silica Co., Chicago, Ill.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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McLain's System, Inc., Milwaukee, Wis.

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Hawley Down Draft Furnace Co., Easton, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Obermayer Co., S., Chicago, Ill.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

GOGGLES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Ingersoll-Rand Co., Montreal, Que.

GRINDERS, DISC, BENCH, SWING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

GRIT, ANGULAR
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Can. Ingersoll-Rand Co., Montreal, Que.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, HAND, TROLLEY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.

IRON FILLER
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Midland Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
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Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hawley Down Draft Furnace Co., Easton, Pa.
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Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Seidel, R. B., Philadelphia.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

MAGNETS
Ding's Magnetic Separator Co., Milwaukee, Wis.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Inspection & Testing Laboratories, Montreal.
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.
Vickers, Charles, 712 Cedar Ave., Niagara Falls, N.Y.

MIXERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Castings of Ottawa, Ltd., Ottawa, Ont.
Davenport Machine & Fdry Co., Davenport, Ia.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Midland Machine Co., Detroit.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

MOLDING SIFTERS
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACES
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Steel Co. of Canada, Hamilton, Ont,

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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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W. W. Wells Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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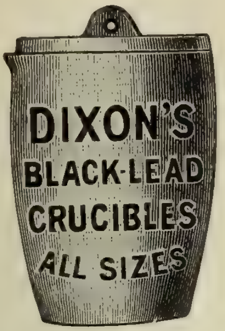
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST ACCESSORIES
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.



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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mott Sand Blast & Mfg. Co., Brooklyn, N.Y.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST GRIT AND SHOT

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST SAND

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
U. S. Silica Co., Chicago, Ill.
E. J. Woodison Co., Toronto.

SAND BLAST SHOT

Globe Steel Co., Mansfield, Ohio.
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago, Ill.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SANDBLAST MATERIAL

Harrison Supply Co., Boston, Mass.

SAND MOLDING

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

SAND SIFTERS

Battle Creek Sand Sifter Co., Battle Creek, Mich.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SEPARATORS

Ding's Magnetic Separator Co., Milwaukee, Wis.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

SHOT

Globe Steel Co., Mansfield, Ohio.
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago, Ill.

SIEVES

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SILICA WASH

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SILICA ROCK, GROUND AND PULVERIZED

Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SKIMMERS, GRAPHITE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

SMALL ANGLES

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SPELTER BOWLS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

SPRUE CUTTERS

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZERS, POWER AND HAND

Can. Hanson & Van Winkle Co., Toronto, Ont.
Davenport Mach. & Fdry. Co., Davenport, Ia.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

STEEL, CRUSHED

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL GRIT

Can. Hanson & Van Winkle Co., Toronto, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

STEEL RAILS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

STEEL BARS, ALL KINDS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

STIRRERS, GRAPHITE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.

TALC

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
E. J. Woodison Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Hersey Co., Ltd., Milton, Montreal, Que.

TEEMING CRUCIBLES AND FUNNELS

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McCulloch-Dalzell Crucible Company, Pittsburg,

TRACK, OVERHEAD TROLLEYS AND TROLLEY SYSTEMS

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

TRIPOLI

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

VIBRATORS

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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Dom. Iron & Steel Co., Sydney, N.S.
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Can. Hart Wheels, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

WIRE, WIRE RODS AND NAILS

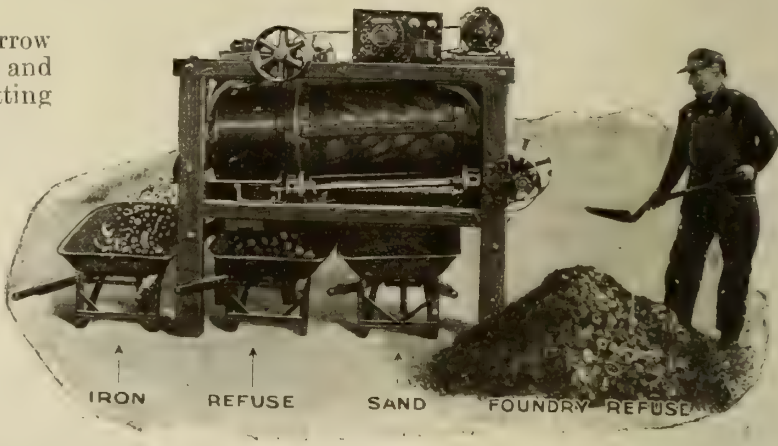
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

DINGS Never-Clog Magnetic Separator

Reclaims all the metal and all the sand in a thoroughly practical way. And it WILL NOT CLOG with any Foundry refuse that a shovel usually handles. Iron is dislodged from magnets without aid of belts, scrapers or other device. No danger of burning out coils as they are wound with magnet wire.

Look at illustration—into the first wheelbarrow goes the Sand; into the second the Refuse; and into the third the Iron. Simple Cost-cutting operation!

Pleased to tell you all you want to know about it. Write.



DINGS MAGNETIC SEPARATOR CO.

800 Smith Street Milwaukee, Wis.

GRIMES ROLL OVER MOLDING MACHINES

The Most Convenient and Most Efficient Molding Machine on the Market.

Built on the principle that the Centre of Gravity is the Centre of Rotation—it is perfectly balanced and the largest flask can be easily and smoothly turned by one man.

Requires less than half the number of steps necessary with rockover machines, and consequently saves much time.

For continuous and economical work you cannot find a more efficient molding machine.

Write to-day for descriptive catalog.

MIDLAND MACHINE COMPANY

811 W. Jefferson Ave., Detroit, Mich.

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Stevens King Kore Kompound

Kuts Kore Kost

> "I am using twenty-six pounds of your KING KORE KOMPOUND, costing thirty cents, where I formerly used six and one-half gallons of core oil costing fifty cents per gallon, or a total of three dollars and twenty-five cents to do exactly the same amount of core binding, and get just as good cores."

> "I can use foundry sweepings, blower dust and old sand with KING KORE KOMPOUND and produce a good, clean, porous core."

The above direct evidence—I have enough of the kind to fill a book — from practical foundrymen, illustrates the folly of using flour, linseed oil, molasses or other binders, when this most economical of all core compounds is available. It uses up the slowest of any and can be used over and over again.

For medium and heavy grey iron, malleable iron, and aluminum castings, including dry sand and skin-dried molds.

The low price is another attraction. Send for a trial barrel on approval—shipped from my Windsor, Ontario, branch.

Stevens Core Gum Best for Small Cores

This is a dry core binder for all sorts of tiny and intricate cores.

It is the strongest core binder for small cores in existence. It will even bind dry coal ashes! A very small proportion is necessary—hence it is very economical to use. Best for brass.

It is far cheaper than linseed oil or its substitutes. Send for a trial barrel on approval—shipped from my Windsor, Ontario, warehouse.

FREDERIC B. STEVENS

Manufacturer Foundry Facings and Supplies, Buffing Compositions and Platers' Supplies

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EXPORT WAREHOUSE: Windsor, Ontario
BRANCH; Hoosier Supply Co., Indianapolis, Indiana
NEW ENGLAND BRANCH: Frederic B. Stevens, Corner Water and Olive Streets, New Haven, Conn., E. E. Seeley, Manager

ROYLITE CHEMICAL CLEANING COMPOUND

ROYLITE

The Best Cleaning Compound Known

Saves Time Saves Labor Saves Money

ROYLITE Cleaning Compound will be found to be one of the greatest discoveries furthering the interests of the Electro-plating Trade, through its increased agencies in removing greases and oil from all metals in the most economical manner. Never before has such unvarying success been discovered. Unlike other chemical cleaners Roylite does not destroy the greases or oils, at the same time destroying itself, but throws these greases and oils from the work, leaving the metal clean and bright. Trials which have been conducted universally with searching thoroughness prove that Roylite is the most economical, rapid, harmless, and lasting compound on the market to-day.

Roylite will clean all metals in a more satisfactory manner more quickly than by the old method of using caustics, which frequently leaves the work showing streaks and discolorments.

Roylite will not tarnish in the process of cleaning and has a tendency to brighten the metal to a noticeable degree.

ELECTRIC CLEANER

Roylite makes a splendid electro-cleaning compound, and we highly recommend it for this use as well as a still cleaner.

Roylite is manufactured by us in Canada, and we are therefore able to give you prompt service at a less cost than cleaners made in foreign countries.

We are prepared to demonstrate the use of Roylite either in our demonstrating plant in Toronto, or in your own plating plant if you so desire, and solicit your correspondence.

WRITE US TO-DAY. *WE CAN SAVE YOU MONEY*

CANADIAN HANSON & VAN WINKLE CO., LTD.
TORONTO, CANADA

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, APRIL, 1918 No. 4

ALBANY

Molding Sand

Wouldn't you like to have uniform sand?
Every car alike?
So your foundry foreman could sleep nights?
Costs no more than the hit-and-miss shipper charges.
We select and grade for the work required.
Result: "The World's Best Moulding Sand."

THE ALBANY SAND & SUPPLY COMPANY
Albany, - N.Y.

Kawin Service Can Save Money in Your Foundry Practice!

Kawin Service has cut the cost of production in United States and Canadian Foundries from the Atlantic to the Pacific—has increased their output, promoted efficiency and in numerous ways put their business on a better organized, better paying basis. These things that we have done for others we can likewise do for you.

Here are some of the things Kawin Service includes:—

Specification for the purchase of raw material and analysis of same.

Proper mixtures for your castings and analysis of your product at frequent intervals.

Reduction of losses to a minimum.

Instituting up-to-date methods of Cupola Practice.

Solving the practical problems that arise in the foundry.

The advice and co-operation of our Foundry Specialists.

We know foundry practice—every angle of it. We have studied it, investigated it and specialized in it. We should be able to assist you—we can assist you.

Get in touch with us without delay

Kawin in Buffalo
Located in the Dun Building
110 Pearl Street

Our new Laboratory at Buffalo is now in full swing. It is fully organized and equipped to take care of the business of our Canadian clients who find it convenient to deal with us at this point. Our Buffalo Laboratory will co-operate with our Toronto Laboratory in promoting the efficiency of their work.

KAWIN SERVICE IS GROWING.

Charles C. KAWIN Company, Limited

CHEMISTS - FOUNDRY ENGINEERS - METALLURGISTS

307 Kent Bldg., Toronto, Can.
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Chicago, Ill.
Dayton, Ohio.
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LET US SELL YOU A

DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it—you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES
don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

THE E. J. WOODISON COMPANY, TORONTO

Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont.

The Publisher's Page

TORONTO MARCH, 1918

Seek an Introduction through Brown

THERE are three men — Brown, Smith and Simpson.

Smith does not know Simpson; Simpson does not know Smith. Brown is a big and influential man. He knows both Smith and Simpson.

The three meet some day and Smith and Simpson are introduced.

Because of the standing of Brown, Smith is satisfied that Simpson is alright and Simpson doesn't have to wonder if Smith is O.K. It is enough that Brown introduced them.

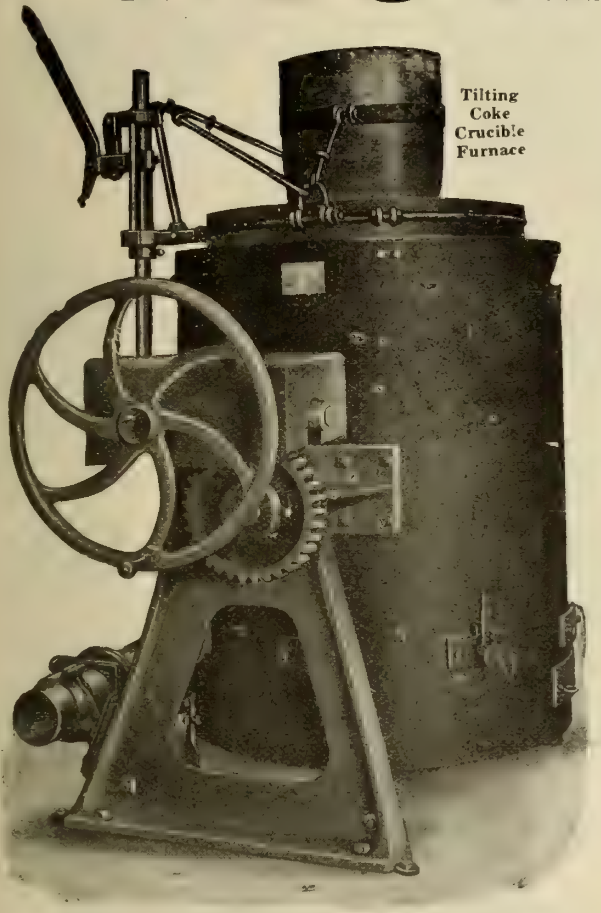
So it goes. Many a fortune has been made through the right introduction to the right man. Many a success could be traced to the occasion when Mr. Brown said: "Mr. Simpson, I would like to introduce a very close friend of mine, Mr. Smith."

And so it is with advertising in a reliable journal. It brings buyer and seller together. Progressive, up-to-date, successful men read papers like this and reliable firms with modern products advertise.

So there you are. Each respects the other. The prospective buyer knows that the advertised product must be good or it wouldn't (and couldn't) be advertised. The advertiser knows that an inquiry from a reader of this journal, for instance, must be worth cultivating and good service is accordingly rendered.

Our Pleasure—to bring you together

Monarchs



Tilting Coke Crucible Furnace

Hopper feed, above ground, shake grates, all size crucibles

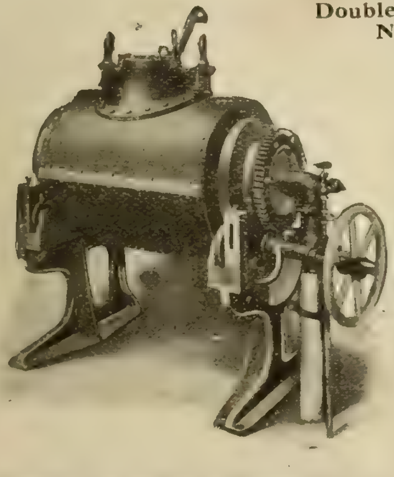
THE next time you hear a foundryman commend the service given by his furnace, look at it sharply and see if it isn't one of the three Monarch Furnaces shown on this page. If it isn't, take a look at the name-plate. You will probably find his furnace a Monarch of another style.

Of the hundreds in use we do not know of one Monarch that has not brought the owner a radical drop in his metal-melting costs — in many instances a drop as great as 50 per cent.

Still we don't ask you to take any man's "say-so." Judge for yourself.

Catalogue on Request.

The Monarch Engineering & Manufacturing Company
1206 American Bldg., Baltimore, Md., U.S.A.
SHOPS AT CURTIS BAY, MD.

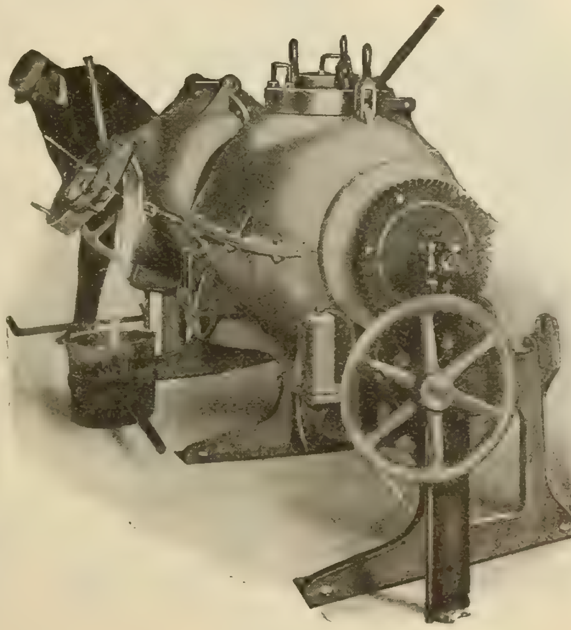


Monarch Rockwell Single Chamber Furnace —"Simplex"

Built on the same lines as the Double-chamber Furnace, but without its continuous heating capacity. Still the fastest and best fuel economizer of its kind.

Monarch Rockwell Double-Chamber Furnace— No Crucibles

Burning oil or gas, melts almost twice as much metal as any other furnace without additional cost for fuel, because it utilizes all the heat from its one burner. While melting in one chamber exhaust heat brings the metal in the other chamber to the melting point.



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of every description

Forged, Riveted or Electric Welded

Let us prove to you the value of Fanner Quality, once tried always used.

HARD IRON TUMBLING STARS

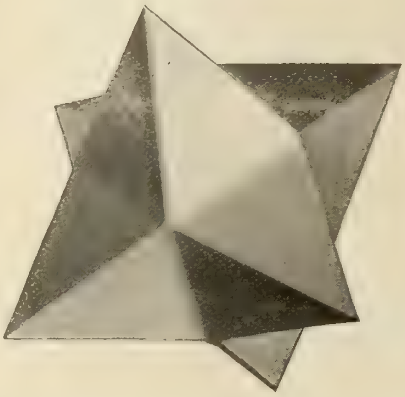
They are sharp—They will last.

Your inquiries always invited.

THE FANNER MANFG. CO.

CLEVELAND, OHIO

Mark Inquiries Dept. C.



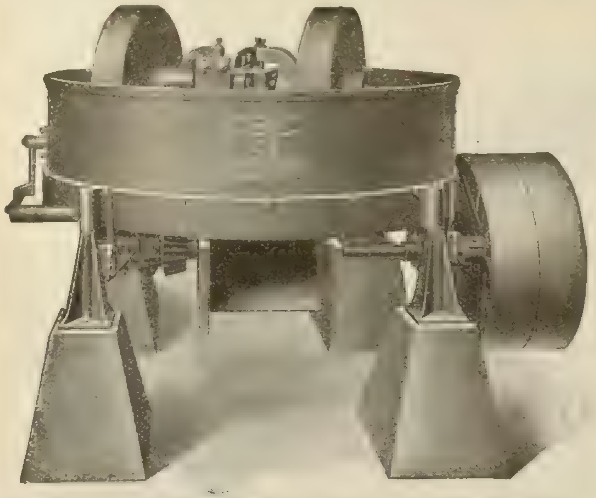
A Message to Canadian Foundries

THE SIMPSON INTENSIVE FOUNDRY MIXER

Saves Both Sand and Labor

Improves the quality of the castings.

Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.

Write for details and prices to

National Engineering Co.

Room 505, Tacoma Bldg.

CHICAGO, Ill.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the best possible wheel for the purpose.

Gresolite

for Grey and Chilled Iron.

Emery

for Steel Foundry and General Purpose.

Corundum and Rexite

for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels

LIMITED

Manufacturers Grinding Wheels and Machinery

456 Barton Street East

HAMILTON, CANADA

Where Are You Going to Get Your Future Foundry Foremen and Superintendents?

McLain says:

"Go to the Sand Heaps—Not to Colleges for Your Future Executives"

The practical molder who will be guided by McLain's System of MIXING IRONS—CUPOLA PRACTICE — and SEMI-STEEL is your best expert. He is on the ground—knows exactly what he wants and how to get the results and has your interest at heart.

The Cupola is the Heart of Your Foundry

it will cause either a profit or loss for you. Take a wide-awake molder or foreman —begin on the cupola first. Teach him the science of melting iron—AT ONCE he will cut your coke bills 10 to 30 PER CENT. — YOUR PIG IRON BILLS from 5 to 25 PER CENT.

Modern Foundry Practice as Exemplified by McLain's System is as Far Ahead of the Average Foundryman's Practice as the Electric Light is Ahead of the Candle.

Our methods cut the cost of the metal before you pour it—your metal brings more PER POUND and that is why the most vital question before foundrymen to-day is—

IF YOU ARE NOT
Following McLain's System and Making
McLain's Semi-Steel
WHEN ARE YOU GOING TO DO SO?

Full particulars FREE

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Send me a copy of new Semi-Steel booklet FREE.
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Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

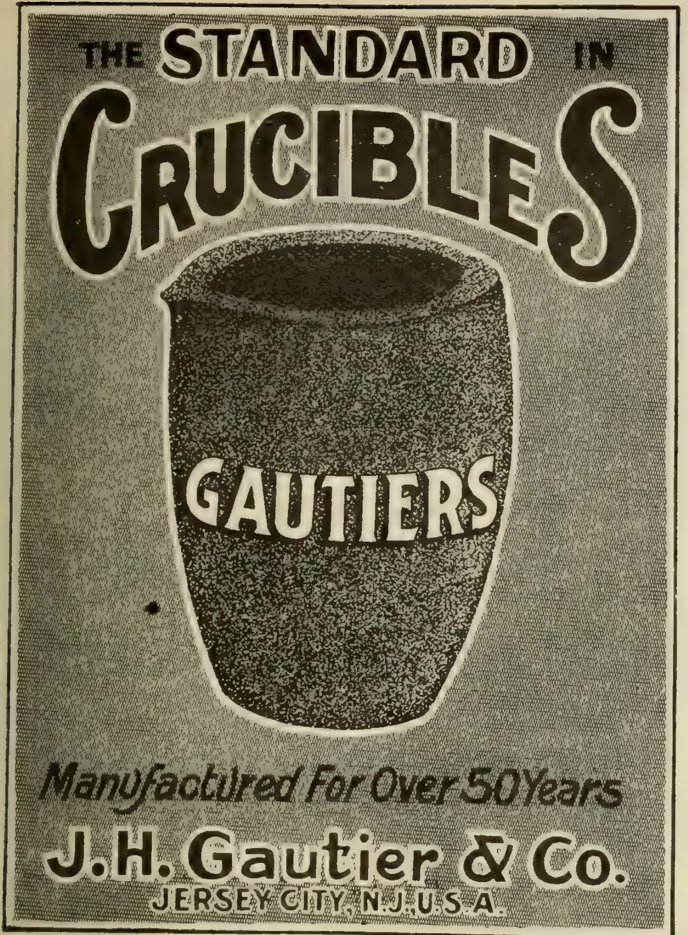
English Moulding Machines

"Jarr" Ramming
"Head" Ramming
"Hand" Ramming

The most efficient on the market.
Well built to suit rough usage.

Write for particulars to the makers.

Britannia Foundry Company
Coventry, England



USE
KAOLIN

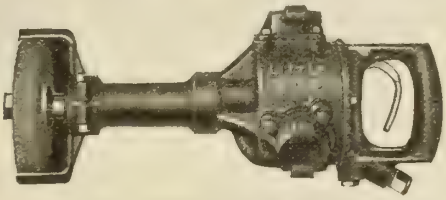
For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

It will save your fire brick and the time of your men.

Whitehead Bros. Co.

Providence
New York
Buffalo

"Little David" Grinder in the Foundry.



No. 7 "Little David" Grinder.

The "Little David" Grinder

makes for money-saving and foundry efficiency.

It is particularly rugged and will stand up under the hard usage such a tool generally receives.

The "LITTLE DAVID" Grinder contains nearly one-third less parts than any similar machine now on the market. This means simplicity and the least possible number of repair parts to provide for. The entire motor runs in a bath of oil, reducing friction and insuring the longest wear.

For some classes of work an extension shaft is provided, 21 inches long, which adds greatly to the usefulness of the tool.

Send for bulletin on "Little David" Drills, Grinders, Chipping Hammers, etc., also "Imperial" Hoists and "Crown" Sand Rammers.

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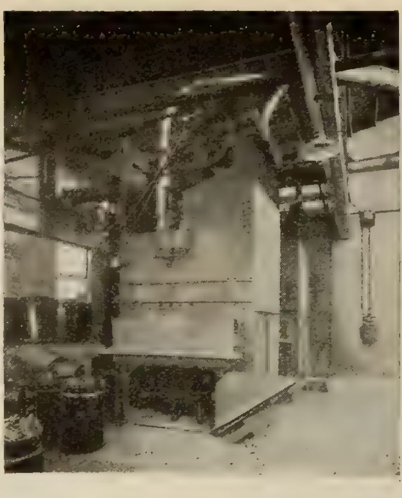


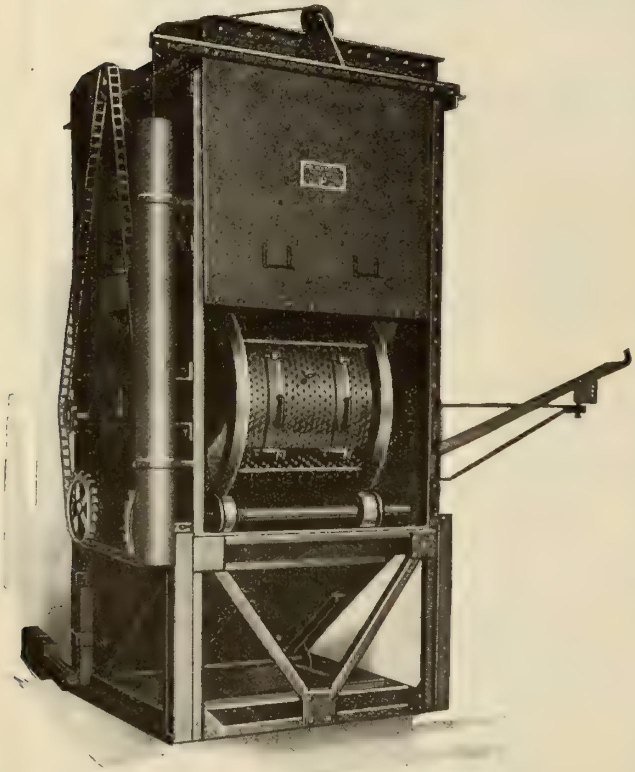
BROWN
SANDBLAST EQUIPMENT

is speeding up sandblasting on important work in the better-managed plants of America. Above is shown an installation of two No. 3 Revolving Barrel Sandblast Machines at the plant of the Auto Specialties Mfg. Co., St. Joseph, Michigan.

The method of charging is shown in the first illustration. The parts to be sandblasted are brought from the annealing room in barrels, and loaded directly into the sandblast machine.

After cleaning, the charge in the machine is unloaded as shown in the center view. A truck, or wheelbarrow, is placed directly under the revolving barrel and the charge is automatically dumped into it. At the right is shown the position of the barrel relative to the annealing room, from which a runway is placed to the loading platform.

There is no unnecessary handling of the material when loading or unloading. And all Brown sandblast equipment is built not only to save labor, but to save time and excessive maintenance expenses. That is why Brown sandblast equipment is making good on such a variety of work under so many different conditions.



No. 2 REVOLVING BARREL SANDBLAST MACHINE

Brown foundry equipment also includes the Hammer core machine for making cores in all shapes and sizes, and the Duplex sand shaker (electric or pneumatic) for saving labor on the sand pile. Brown descriptive literature tells more about all Brown foundry equipment.

Brown Specialty Machinery Co.

2514 W. 48th Place **Chicago**

A SERVICE THAT PAYS

Foundry Owners and Foundry Foremen, with material and production conditions as they are to-day, are turning to more economical foundry practices and a more systematic foundry control.

ECONOMY, SAVINGS AND EFFICIENT OPERATION MUST BE EFFECTED.

OUR CONSULTING SERVICE

of practical Foundrymen and Metallurgists insures for your foundry economies that will yield a dividend and practices that make for efficient operation, uniform quality and the elimination of waste.

WHY NOT CONSULT OUR FOUNDRYMEN AT ONCE.

MILTON HERSEY COMPANY, Ltd.

INDUSTRIAL CHEMISTS AND CONSULTING FOUNDRYMEN.

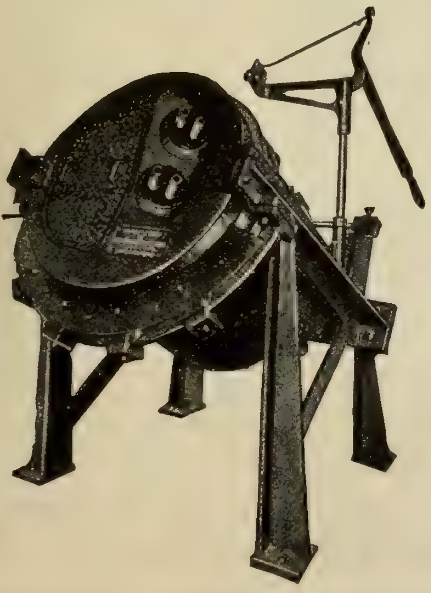
MONTREAL WINNIPEG

Tumbling Mills, Cinder Mills, Resin Mills, Dust Arresters, Core Sand Reclaimers, Cupolas.

These are some of our lines.

Full list upon request

SLY Foundry Equipment



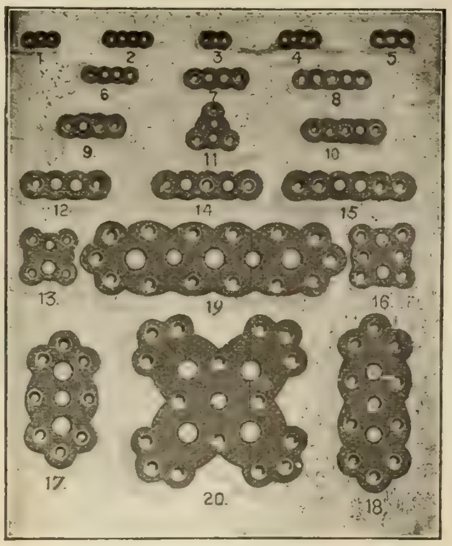
mirrors an intimate knowledge of the conditions and needs in Canadian foundries. "It fits in admirably" and "It economically meets our exact requirements," say well-satisfied users whose names we'd be glad to give you.

Sly Drawer Type Core Ovens save fuel because of the improved arrangements of flues and dampers. The ease of control and the more even distribution of heat make the quick, thorough baking of cores a simple matter.

The Sly Sand Blast with NO-Wear Nozzle will clean more castings daily than any other you can procure. That is a strong statement; we wouldn't make it without the proofs to back it up. **Write for them.**

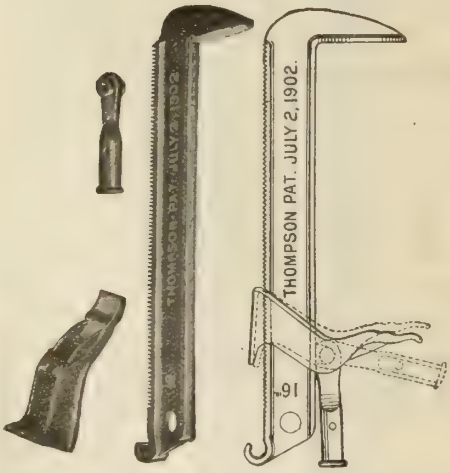
The W. W. Sly Manufacturing Co.

Cleveland, Ohio, U.S.A



Obermayer Rapping Plates and Lifters

Our Rapping Plates and Lifters are the best made from Malleable Iron. Smooth, true, straight, accurately machined and tapped.



Thompson's Patent Adjustable Malleable Iron Flask Clamps

Seven Sizes—10 to 42 inches.
Practically indestructible.
Cost no more than the ordinary kind.

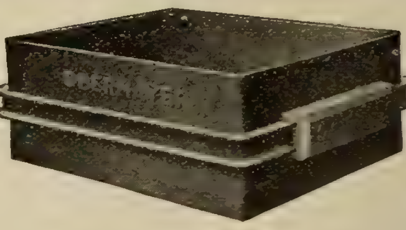
The Foundryman's MARKET PLACE —Obermayer's

Obermayer National Iron Filler Cement

Repair Defective Castings with National Iron Filler Cement

With a can of this cement handy there is no use scrapping castings because of blowholes, cracks and other unsightly defects. It's a very easy matter to repair such blemishes by simply mixing a quantity of National Iron Filler Cement with a little water and applying this with a knife. This cement settles in a few hours and becomes as hard as the iron itself, and you cannot tell that the casting has been repaired. In 12-lb. Tin Cans and 100-lb. Kegs. Free samples on application.

Obermayer's, for 44 years has been known as "the foundryman's market place," and it has earned its name. There is not an item that the foundryman uses that we cannot supply. We carry a complete stock at all of our warehouses—there is a warehouse at every branch. Catalog No. 49 is just off the press—send to the nearest branch for your copy.



Obermayer Improved Heavy Reinforced Jackets

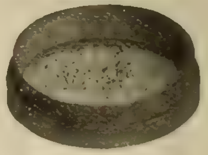
Made for either Tapered or Straight Flasks.

With or without wood handles.

Made of No. 10 special black steel. Practically indestructible.

Channel-iron reinforcement at center prevents any possibility of warping.

Prices range from $1.50 up.



"Esso" Quality Foundry Riddles

The strongest, heaviest and best made Riddles on the market.

ROCK ELM RIMS

Full Specifications Furnished on Request

Made in Heavy Galvanized and Brass—16", 18", 20", 21", 22" diameter.

THE S. OBERMAYER CO.

Manufactures Everything You Need in Your Foundry

Chicago Cincinnati Pittsburgh St. Louis Denver Los Angeles

Canadian Representative: E. B. Fleury, 1609 Queen St. W., Toronto, Ont.

The Canada Metal Co. Ltd.: Its Development and Product

Staff Article

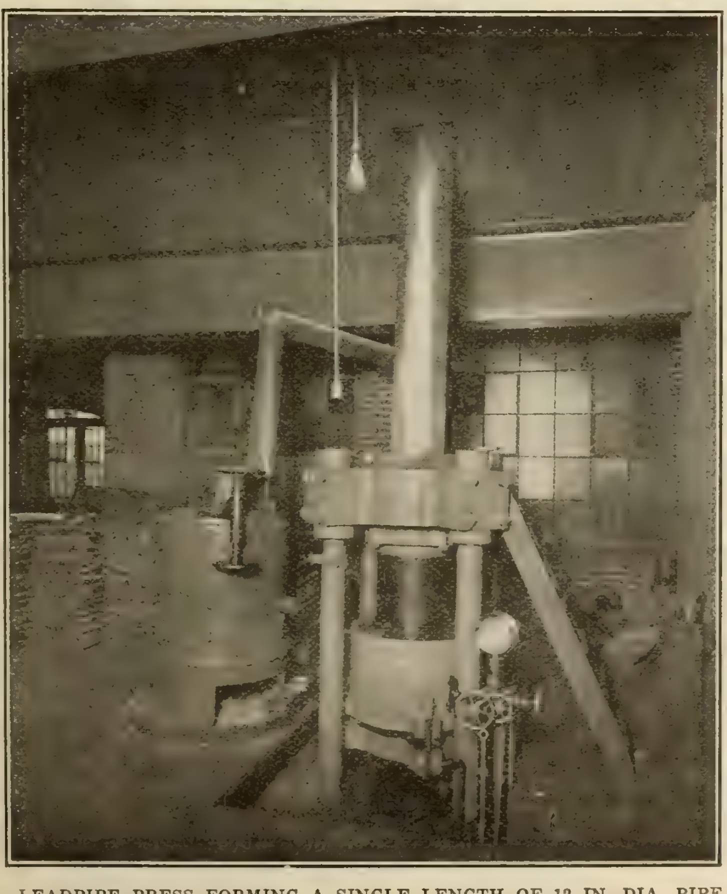
A feature of the numerous references frequently made regarding Canada's natural resources is the fact that non-ferrous metals constitute a more valuable portion of the total than is generally realized. The indispensability of the more familiar metals—lead, zinc, copper, etc.—has been brought home to us in a convincing manner this war time, thereby imparting a unique importance to such firms as operate in these and kindred metals.

THE extent to which engineering and iron and steel industries have been called upon to aid the cause of liberty has been so great and spectacular, that the degree to which the non-ferrous metal industry has contributed to the cause is not nearly so fully realized. The over shadowing of the soft metals by the hard is not altogether unexpected, but the indispensability of lead, antimony, aluminum, copper and zinc, to say nothing of tungsten, molybdenum, chrome, etc., will be evident to the casual reader when due consideration is given to the requirements of the war,—lead and antimony for bullets, aluminum for engine and aeroplane parts, copper for driving bands, and along with zinc for the numberless items of brass,—these alone indicate slightly the extent of the non-ferrous metal industry and impart more than passing interest to the plant and products of the Canada Metal Co., Toronto, Ont.

Consistent Growth

This firm occupies a prominent place in that category of manufacturing establishments whose growth has been contemporaneous with, and emblematic of the rapid industrial development of the Dominion during the last two decades. Like many other businesses typical of Canada's growth and opportunities, the company represents the life efforts of W. G. Harris, president, assisted by his son Wm. G. Harris, junior, vice-president; their operations commenced on a comparatively small scale, have been attended by a consistent growth and success now represented by branch factories in Montreal, Winnipeg and Vancouver. The range of product includes a great diversity of non-ferrous metals. Babbitt, battery zincs, solder, pig lead, lead pipe, antimony, ingot tin, stereotype and all white metal mixtures and the production of die-castings are but one part of the product. Plumbers' lead pipe fittings, metal bar for art glass work, ventilators, sash bars, etc., occupy a prominent place in the firm's output.

The production of babbitt metal is one of the most widely known of the company's activities and a close acquaintance with their plant and methods is confirmatory of the reputation gained by this product. One of the first things noticed by the visitor is the piles of tin pigs or ingots, especial interest attaching to this metal because the two principal, if not the only sources from which it can be obtained at present, are both in the British Empire. The Straits Settlements, that far eastern dependency of Britain, is the source of the finest and most tin in the world, and the fact that it is obtainable in reasonable quantity at this time is a tribute to Britain's control of the ocean. The other source referred to is in England itself—the ancient tin mines of Cornwall, worked by the Romans, and to-day supplying tin to a British colony, whose extent and potential wealth exceeds any thing the most ambitious Caesar ever dreamed of. And as if to prove that Canada lacks not herself, mounds of lead ingots from British Columbia lie alongside the tin, their birthplaces separated by a third of the globe's circumference, and here united to produce an article of Canadian manufacture which in many diverse applications is helping our forces win the war.

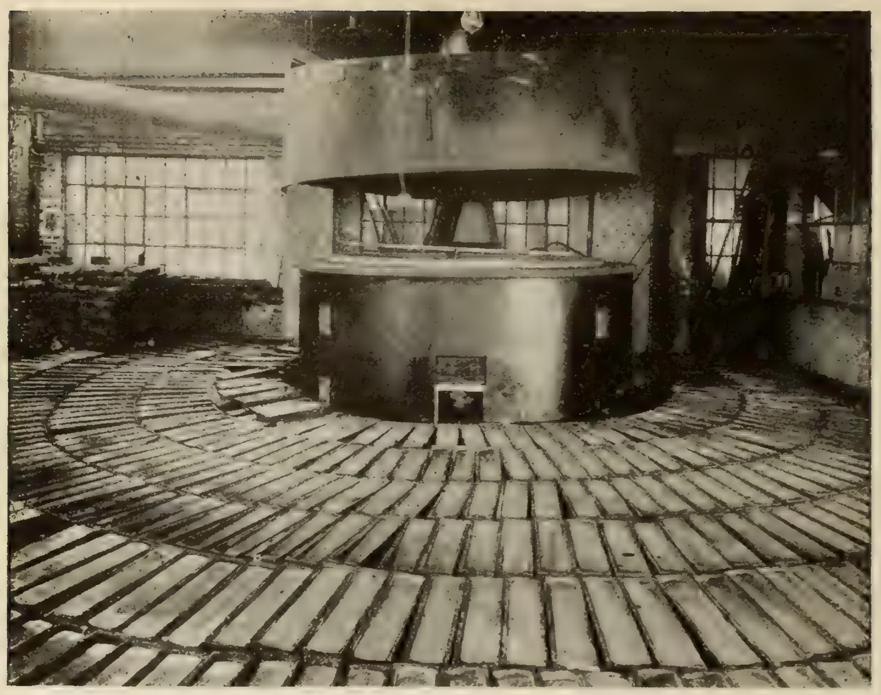


LEADPIPE PRESS FORMING A SINGLE LENGTH OF 12 IN. DIA. PIPE WEIGHING 900 LBS.

Babbitt and Lead Products

The production of babbitt metal is not accompanied by the clatter and rattle and din of shell manufacture nor is there the hustle and bustle of numerous operatives, gaugers and inspectors; instead there are large melting pots reminiscent of soldiers' soup boilers, next them are the various quantities of selected metals, while a silent individual passes to and fro, glancing at pyrometers which indicate the progress of the melt, sampling the products and despatching them to the laboratory for analysis to check his work, and finally when the alloy has reached the stage where the various contents are in proper condition to exert their full individual and collective influences, the metal is ladled out and poured into the metal moulds which give it the familiar form in which it reaches its users. The entire process is characteristized by a confident calmness and unobtrusiveness of operation which reflects the confidence of the operator in the guiding influence of the laboratory worker.

And so it is with all of the work throughout the factory. Leaving the refinery with its cauldrons of liquid metal, not white hot and glaring like a steel works, but glittering with a sheen like liquid silver, and noting with interest the three 35-ton melting pots which are the largest of their kind in the British Empire, the visitor passes to the pipe shop, where a battery of six presses form the lead and various alloys into the numerous forms in which they reach the consumer. One of the illustrations shows a lead pipe press in operation. It is operated by hydraulic power, the cylinder which contains the ram extending down into a pit below the floor level. The upper end of the ram projects into the extruding cylinder which has suitably arranged dies on its upper end. This cylinder is filled with molten lead at a suitable heat, which, when subjected to pressure by the ram from below, is forced out through the dies, and



A CAST FROM ONE OF THE 35-TON MELTING POTS WHICH PRODUCE ANTI-FRICTION BEARING METALS.

assumes the desired shape—circular, square, oval or otherwise.

The engraving shows the melting pot next the press, in which the metal is kept at the required temperature. As shown, the press has just extruded a single piece of lead pipe having a diameter of 12 in. and a weight of almost 900 lbs. In the case of small pipe and rod, the product is guided as it leaves the dies and is wound around reels which form it up into the coils in which it is marketed. Machines of this type produce the miles of lead wire and solder which are annually consumed in all branches of manufacture.

Sheet Rolling

Equally interesting are the rolls in which thick slabs of lead are gradually squeezed down to the various thicknesses required in commerce. A slab of lead, say 30 in. by 18 in. by 3 in. thick is cast in the refinery and after analyses and grading, in placed on the table of the rolling mill. This table is fitted with numerous rollers similar to a steel mill, which enables the slab of metal to be moved back and forth easily. The slab is brought up against the rolls which are adjusted to a height somewhat less than the thickness of the slab. A slight pressure causes the revolving rolls to bite and the metal is drawn in and reduced in thickness as it passes through. The table extends a considerable distance on each side of the rolls so as to accommodate the increased length of the metal as it is gradually reduced from the slab to sheet form. At the far end of the top roll, shown in one of the illustrations, can be seen an operator feeding down the top roll to the required thickness of the finished sheet the amount of each reduction being dependent on the power of the mill and the grade of metal being worked, pure lead with a high degree of ductility being capable of much heavier reductions than other grades whose composition is varied for specific reasons.

From this department the sheet lead may either go to the shipping department or, if intended for final reduction to very fine thicknesses, it is taken to the finishing rolls, where such specialized products as tea lead and so forth are made. Here the rolls are of comparatively small size and very highly polished. They are fitted with wiping mops which remove any foreign particles from their surface and prevent damage to the thin highly finished sheets which are so familiar in the form of tea packages, and linings for sheets. Needless to say, the high ductility demanded in lead for this purpose is easily obtained by the refining and controlling methods employed by the company.

The sheet and pipe forms of lead absorb a considerable portion of the output of this metal, but with characteristic progressiveness the firm has found other forms in which to market its product. Die casting, with its everincreasing applications has been successfully undertaken, and castings of any required white metal alloy are now produced in considerable quantity. The manufacture of hollow metal bars in various metals for use in art glass work, sash bar sections, and ventilator materials are allied lines, while further activities include the manufacture of special brass nails for aeroplane construction, and copper nails for shipbuilding requirements, the raw material for which is conveniently produced in the plant.

Subsidiary Developments

The valuable trade connections formed through the manufacture of plumbers' lead fittings gradually paved the way for the handling of bath room fixtures, tubs, lavatories, etc., and an extensive business in this line has developed in late years. A special department is devoted to the making of stone laundry tubs for domestic use, and the complete manufacture of these articles is done on the premises. Carefully selected materials, properly constructed moulds, and a closely controlled method of tempering or seasoning insure a finished article having perfect uniformity of quality, and reliability of construction.

ROLLING MILL DEPARTMENT WHERE LEAD INGOTS ARE ROLLED OUT INTO SHEETS.

Two departments, not previously referred to in detail, contribute largely to the success of the company's efforts. These are the tool room and the laboratory. The former is necessary in order to build the various machines and devices which have been developed through years of concentrated effort and singleness of purpose. The latter is equally as necessary to check the product in various stages and devise new mixtures and alloys and assist in supplying material exact to customers' specifications. Each is equipped with the best and most suitable tools and equipment. Machines and tools for the rapid and accurate production of dies, or the building of special mechanism, are installed, and skilled labor familiar through long usage with the peculiar requirements of metal working apparatus is employed throughout. The laboratory, of which a view is reproduced, contains many delicate instruments, scales, furnaces, testing machines and reagents to enable the chemist to feel the pulse of the work at all stages, direct the efforts of the various departments intelligently and accurately, and at all times maintain the quality of the product up to specification. By such methods, equipment, plant and employees the Canada Metal Co. has gradually, rapidly and safely developed a highly specialized line of manufacture which has stood the country in good, yet silent stead through these critical times, and which will doubtless prove of equally as great avail in the future.

OVERSEAS CORRESPONDENCE

IN a recent report, Harrison Watson, Canadian Trade Commissioner, London, writes as follows:—

"It is clear that owing to lack of means of ocean transportation, United Kingdom import restrictions, and the increasing Government control over the importation and distribution of supplies of all kinds, actual transactions in most lines of Canadian exports are practically impossible at the present time. Upon the other hand, it is a favourable time for propaganda work.

"Owing to complete trade dislocation resulting from the war, it is necessary to seek new sources of supply of most articles and this important subject is now receiving attention from both public bodies and business firms. As, in addition, there is a very strong desire to obtain these supplies from within the British Empire, and indeed to increase inter-Imperial trade relations of all kinds, Canadian producers, manufacturers, and shippers should be urged to take the fullest advantage of the opportunity.

W. G. HARRIS,
President, Canada Metal Co.

A CORNER OF THE LABORATORY, SHOWING BALANCES, TESTING MACHINES AND CHEMICAL APPARATUS.

"While it is apparent that under present circumstances the work of the Trade Commissioner service in Great Britain must necessarily be mainly confined to spreading a better knowledge of Canada's resources with a view to trade after the war—and this is even more the case in the provinces than in London—the Trade Commissioners, aware of the keen desire of Canada to increase and develop export trade, inform inquirers that Canadian shippers propose making every effor to increase their export trade, and while it is obvious that actual business is impossible at the present time they urge United Kingdom importers in the meantime to initiate correspopndence with Canadian houses, so that information can be supplied and arrangements negotiated which will make definite transactions possible when the war ends.

"For this reason Canadian exporters are urged to make a special effort to reply a little more fully to letters of inquiry addressed to them by potential customers in this country, as a means of getting hold of connections which should be valuable later on, this more particularly as it is so frequently brought to the notice of Trade Commissioners that firms in all parts of this country who have been supplied with the addresses of Canadian houses are greatly disappointed at the results of letters which they write to Canada and the meagre information supplied, in comparison with the response which they receive from other countries to which similar inquiries have been addressed.

Should Anticipate Future Business

"Although persons who are fully aware of the situation which has been existing in Canada for some time past, whereby the complete energy of manufacturers, shippers, and producers has been directed to furnishing war material and supplies for the Allies, will appreciate that Canadian business houses have had little time to attend to anything else, the majority of firms in this country are unaware of this position, and attribute delay, and even failure, to reply to letters to a lack of interest and cordiality. It is obvious that a prompter and fuller response to applications for information would materially assist the efforts of the Trade Commissioners in this country to attract attention to Canada's great resources and trade possibilities."

The Organization of an Efficient Foundry Costs System

By M. H. Potter

An efficient costs system is a necessity for the successful operation of the modern industrial plant. Without one the organization throughout is at a loss for information regarding the cost of making and merchandizing the articles manufactured, and no systematic allocation of overhead expenses is possible. In the following article a description is given of one system developed for use in the foundry, the various costs being reduced to a poundage basis.

DURING the past few years rapid advances have been made in the foundry industry along mechanical lines. Some progress has been made towards better business methods and more efficient systems of organization, but it has been rather slow. The following practical system will effect economies in almost any casting plant.

Gradually, foundrymen are realizing that a well-equipped shop is only half the battle and that correct business principles are equally important. Consequently there is a growing interest in cost keeping, since business, if it be done at all, must be executed at a profit, and work turned out at a loss is worse than none at all.

Cost Keeping Difficult

One reason why the foundry trade, referring especially to the jobbing shops, has been slow to take up the cost keeping question has been due to the difficulty in working out systems that are efficient, accurate and also inexpensive. The few shops fortunate enough to have good cost systems have jealously guarded the details, with the result that many plants are working in the dark, often bidding low and preventing the whole industry from being conducted on a profitable plane.

It should be stated at the outset that the figures given in the accompanying forms are introduced simply for the purpose of illustration. They are purely arbitrary and, while an attempt has been made to use reasonable values and preserve correct proportions, the figures given do not represent actual costs, either in the shop under discussion or in any other plant.

The cost of castings is estimated on a basis of material and moulding labor according to the following formula:

$$\text{Cost per pound} = \frac{W P + L + F L}{W}$$

Where—

W is the total weight of metal required for the casting.

P is the price of metal per pound.

L is the cost of moulding labor for the casting.

F is a factor which expresses all other expenses in terms of moulding labor.

W is the weight of finished casting.

The factor F is obtained from the monthly cost sheet and includes the following items, each expressed as a per cent of the moulding labor:

$F = N + M + I + C + O$ where N is the non-productive department labor:

M is miscellaneous expense in the moulding department.

I is fixed expense in the molding department.

C is the cleaning department expense.

O is core department expense.

In applying this formula the cost record must be depended upon the furnish the price of the metal per pound, P the cost of moulding labor for the casting L, and the factor, F, the latter being especially important since it involves a number of elements. The records necessary to supply this information are kept on three simple forms, which are illustrated herewith.

MONTHLY DISTRIBUTION OF FIXED CHARGES FOR YEAR 1917.

DEPARTMENT NUMBER.	INVESTMENT ACCOUNT.			DEPRECIATION ACCOUNT.			MAINTENANCE		INSURANCE		TAXES.		POWER.
	VALUATION BASED ON APPRAISAL AND REAL ESTATE OWNED	RATIO PER CENT.	MONTHLY CHARGE BASED ON 5% YEARLY ON INVEST.	TOTAL DEPRECIATION VALUE JAN. 1 1916	TOTAL DEPRECIATION VALUE DEC 31 1916	MONTHLY CHARGE FOR DEPRECIATION.	YEAR'S TOTAL MAINTENCE	MONTHLY CHARGE	PER CENT INSURANCE VALUE	MONTHLY CHARGE	% TAXABLE PROPERTY	MONTHLY CHARGE.	
ONE	$22,500	45	$94	$11,250	$10460	$ 66	$270	$ 23	36	$ 16	$45	$ 7	
TWO	13,500	27	56	6,750	6,270	40	160	13	26	11	27	4	$15
THREE	1,900	3·8	8	950	878	6	23	2	7	3	5	1	
FOUR	11 000	22	46	5,500	5,116	32	134	11	30	13	22	2	85
FIVE	1,100	2·2	4	550	526	2	13	1	1	2	1	1	
TOTALS	$50,000	100·00	$ 208	$25,000	$23,250	$ 146	$600	$50	100%	$45	$100	$15	$100

FIG. 1.—MONTHLY SUMMARY OF COST ITEMS BY DEPARTMENTS.

Monthly Distribution

Once a year the monthly distribution of fixed, overhead charges is made out by departments according to the form shown in Fig. 2. Every month a summary of the detailed costs of each department is computed in the form shown in Fig. 1. From this sheet the correct values for the unknown quantities in the cost formula are obtained; also a series of these sheets covering a period of a year or more provides opportunity for exceptional value comparisons. A daily record of the principal cost and financial items, concerning which information is desired, is kept as indicated in Fig. 3.

Molding	$1200	$800	66.7	$800	$1600	133	$2800			Insurance	2	
Cores		125	10.3	80	205	17	205			Taxes	1	
Cleaning		1125	94.0	630	1755	146	1755	Salaries	$600	Interest	60	
TOTALS.	$1200	2050	171.0	$1510	3560	296	Cost Dept. 1			Teaming	220	
										Express	50	
							$4100			Miscellaneous	50	
										Discounts	60	
WHOLE PLANT.	$1200	$2050	171.0	$1510	$4760		$8860			Selling Exp.	125	
										Contr. Labor	100	
										Sub. Total	675	
										Credit Disc Earned	25	
								TOTALS.	$600		$650	$1250

FIG. 2.—DISTRIBUTION OF FIXED CHARGES BY DEPARTMENTS

The first step in the practical application of this cost system consists in determining the fixed charges shown in Fig. 2. The fixed charges include interest on investment, depreciation, maintenance, insurances and taxes. For each of these items a monthly charge, showing the burden carried by each separate department, is computed.

Take for example the investment account. The total valuation of the plant based on appraisal and cost of real estate is assumed at $50,000. For the purpose of cost keeping the plant is divided into five departments, namely, melting, moulding, core, cleaning and office. The proportion of the total investment of $50,000, chargeable to each department is indicated in Fig. 2, and a monthly charge based on 5 per cent. interest on the investment in each department is calculated. The investment in department 1, melting, being $22,500, the interest on this sum at 5 per cent. is $1,125 per year, or $94 per month approximately. In a similar manner the monthly investment charge for department 2, moulding, is found to be $56; for department 3, core, $8; for department 4, cleaning, $46, and for department 5, office, $4, or a total of $208 per month, equivalent to 5 per cent. interest in the aggregate investment of $50,000.

Computing Monthly Depreciation

The amount chargeable to each department monthly for depreciation is computed in a slightly different manner. As indicated in Fig. 2, there are two columns under depreciation account, which show the total depreciative value of the investment in each department at the beginning of the year and again at the end of the year.

The difference between these two quantities in each case is the total depreciation. This amount divided by 12, of course, gives the monthly depreciation charge directly. For instance, in department 1 the total depreciation value at the beginning of the year was $11,250, and at the end $10,460, the difference being 790, or $66 a month. The depreciative value of the entire plant at the beginning of the year is assumed as $25,000, or one half the total investment. While these figures are arbitrary in an actual case the depreciative value never equals the amount invested, since there is considerable property, such as real estate, which does not frequently depreciate and which, in certain cases, may even grow in value. When the various sums of depreciation have been computed in the manner described they may then be reduced to a percentage basis if desired.

Maintenance includes such extraordinary repairs and replacements as cannot be properly charged to depreciation, and which ahe always too large to be charged to operating expenses. The total of such charges for each department for the year is given in Fig. 2 under maintenance, and these items divided by 12 give the proper monthly charges. In a similar manner the insurance and tax items divided by 12 give the proper monthly charges, using the proper per cent. in insurable value and taxable property in each case as a basis.

The various calculations give a series

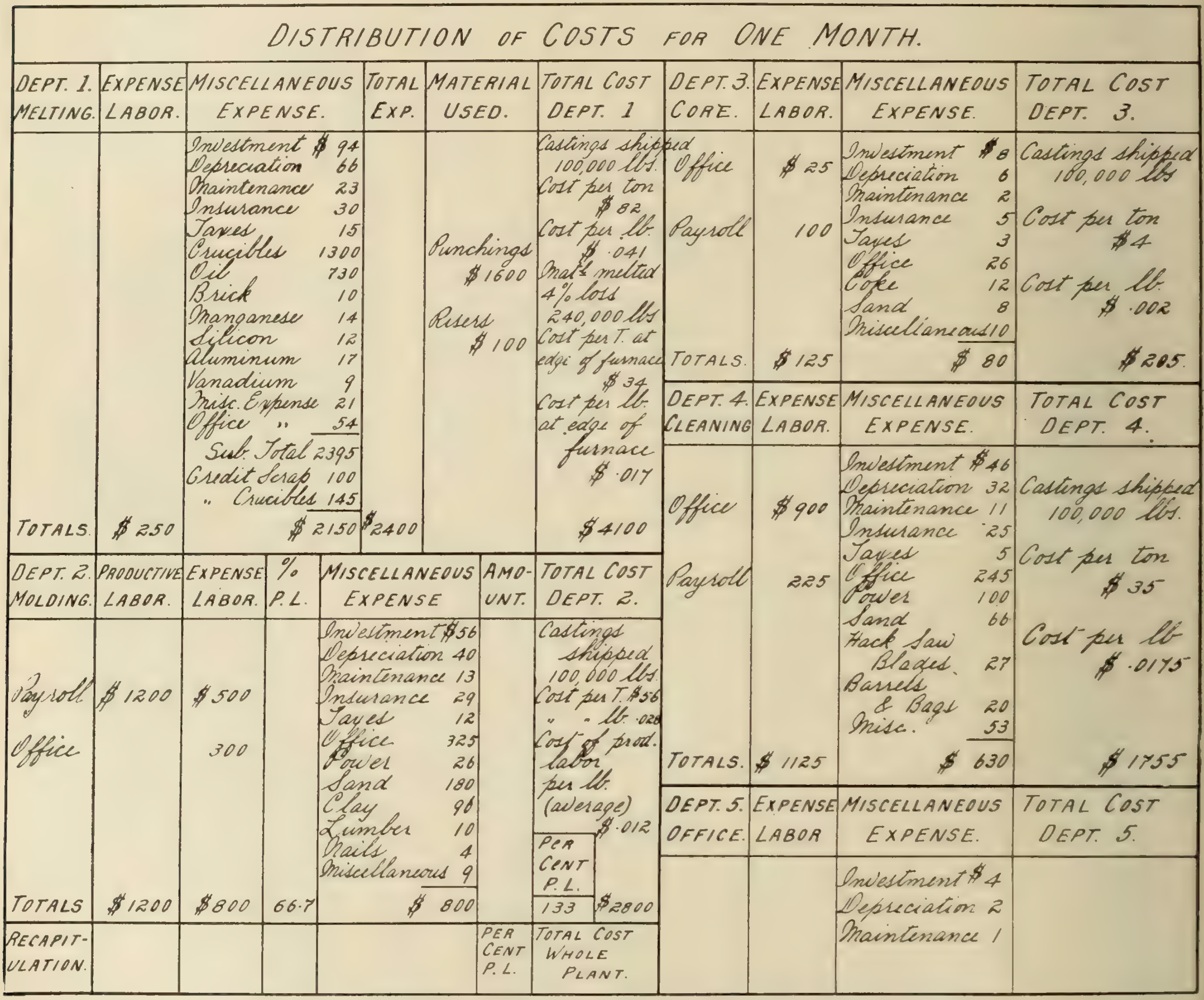
DAILY SUMMARY FOR ONE MONTH.

WORKING DAY	DATE	TONNAGE	BANK BALANCE	ACCOUNTS RECEIVABLE	ACCOUNTS PAYABLE	CASTINGS SCRAPPED.	FURNACE SCRAP	FLOOR SCRAP	GATES AND RISERS	SALES	LABOR.						NO. OF FURNACES RUNNING	NO. OF HEATS	NO. OF POTS	PUNCHINGS USED	SCRAP USED
											MOLDING	CORE	CLEANING	FURNACE	OFFICE	TOTAL					
			$	$	$	LBS.	LBS.	LBS.	LBS.	$	NUMBER OF MEN.									LBS.	LBS.
1	1																				
2	3																				
3	4																				

FIG. 3.—DAILY SUMMARY OF COST ITEMS

of monthly charges, which may be transferred directly to the distribution sheet, showing the detailed costs in each department.

A monthly summary, showing the costs of each of the five departments is made out according to the form given in Fig. 1. From this summary the correct value for the factor F in the cost formula is obtained. The greatest simplicity coupled with accuracy has been aimed at in making up these sheets. The expenses in each department are divided into a number of general groups, such as labor, material and miscellaneous expense. The proper items for interest on investment, depreciation, maintenance, insurance and taxes are entered under a general head of miscellaneous expense in each case.



DISTRIBUTION OF COSTS FOR ONE MONTH.

DEPT. 1. MELTING.	EXPENSE LABOR.	MISCELLANEOUS EXPENSE.	TOTAL EXP.	MATERIAL USED.	TOTAL COST DEPT. 1
		Investment $ 94 Depreciation 66 Maintenance 23 Insurance 30 Taxes 15 Crucibles 1300 Oil 730 Brick 10 Manganese 14 Silicon 12 Aluminum 17 Vanadium 9 Misc. Expense 21 Office " 54 Sub. Total 2395 Credit Scrap 100 " Crucibles 145		Punchings $1600 Risers $100	Castings shipped 100,000 lbs. Cost per ton $82 Cost per lb. $ ·041 Matl melted 4% loss 240,000 lbs Cost per T. at edge of furnace $34 Cost per lb. at edge of furnace $ ·017
TOTALS.	$250	$2150	$2400		$4100

DEPT. 2. MOLDING.	PRODUCTIVE LABOR.	EXPENSE LABOR.	% P.L.	MISCELLANEOUS EXPENSE	AMOUNT.	TOTAL COST DEPT. 2.
Payroll Office	$1200	$500 300		Investment $56 Depreciation 40 Maintenance 13 Insurance 29 Taxes 12 Office 325 Power 26 Sand 180 Clay 96 Lumber 10 Nails 4 Miscellaneous 9		Castings shipped 100,000 lbs. Cost per T. $56 " " lb. ·028 Cost of prod. labor per lb. (average) $ ·012
TOTALS	$1200	$800	66·7	$800		PER CENT P.L. 133 $2800
RECAPITULATION.					PER CENT P.L.	TOTAL COST WHOLE PLANT.

DEPT. 3. CORE.	EXPENSE LABOR.	MISCELLANEOUS EXPENSE.	TOTAL COST DEPT. 3.
Office Payroll	$25 100	Investment $8 Depreciation 6 Maintenance 2 Insurance 5 Taxes 3 Office 26 Coke 12 Sand 8 Miscellaneous 10	Castings shipped 100,000 lbs Cost per ton $4 Cost per lb. $ ·002
TOTALS.	$125	$80	$205.

DEPT. 4. CLEANING	EXPENSE LABOR.	MISCELLANEOUS EXPENSE.	TOTAL COST DEPT. 4.
Office Payroll	$900 225	Investment $46 Depreciation 32 Maintenance 11 Insurance 25 Taxes 5 Office 245 Power 100 Sand 66 Hack Saw Blades 27 Barrels & Bags 20 Misc. 53	Castings shipped 100,000 lbs. Cost per ton $35 Cost per lb $ ·0175
TOTALS.	$1125	$630	$1755

DEPT. 5. OFFICE.	EXPENSE LABOR	MISCELLANEOUS EXPENSE.	TOTAL COST DEPT. 5.
		Investment $4 Depreciation 2 Maintenance 1	

FIG. 4.—FORM USED FOR SHOWING THE DISTRIBUTION OF COSTS FOR ONE MONTH.

Division in Melting Department

Taking for instance the melting department, the monthly charge for investment, as shown in Fig. 2, is $94, and under depreciation and maintenance $66 and $23 respectively. These items are set down against investment, depreciation and maintenance under the general heading miscellaneous expense in that portion of Fig. 1 devoted to melting department costs. In a similar manner the monthly fixed charges for the other departments, as given in Fig. 2, are transferred to the distribution sheet, Fig. 1. It will be noticed that the items charged to insurance and taxes in Fig. 1 do not correspond with the monthly charges for insurance and taxes for the various departments as given in Fig. 2. This is because an amount covering liability insurance and special taxes from month to month is added to the fixed portions of these items when they are entered in Fig. 1.

Office Expense

There is no factor in the cost formula for office expense. This item, which amounted to $1,250 in the expense under discussion, is included in the costs charged to the other four departments. The subdivision is based on the ratio of the payrolls in the various producing departments. The total office expense, $1,250, consists of salaries $600, and miscellaneous expense $650, as indicated in Fig. 1.

The payrolls in each of the other four departments, melting, moulding, core and cleaning, are $200, $1,200, $100 and $900 respectively, the total being $2,400. The payroll in the melting department, $200, is therefore 8 1-3 per cent. of the total payroll of $2,400. Hence 8 1-3 per cent. of $1,250 office expense is charged to office in the cost of operating department.

The detailed expenses of department 1, melting, are grouped under three headings, namely, labor, expense, miscellaneous expense and material used. Space is also provided on the cost sheet for the total cost as indicated in Fig. 1. The heading expense labor includes $50, office labor charged to department 1, as explained above, and the $200 payroll. The latter covers the wages of the melters and their assistants, the total charged to expense labor being $250.

Under miscellaneous expense are grouped the five items covering fixed charges, namely investment, depreciation, maintenance, insurance and taxes. The method of entering the proper amounts against these items has been explained, miscellaneous expense also includes the amount paid out for crucibles, oil, brick, manganese, silicon, etc.

Since the melting department payroll is 8 1-3 per cent. of the total payroll, $54, of the $650, miscellaneous office expense is also charged with the foregoing items. The melting department is credited under miscellaneous expense with the scrap and crucibles sold, the net sum chargeable to the department being $2,150. In this case it is also assumed that the material used during the month cost $1,700, making the total charged to department 1, $4.100. It is also assumed that 100,000 pounds of castings are shipped. The cost per ton is therefore $82, and the cost per pound is $0.041. The cost per ton at the edge of the furnace, that is the cost based on material melted instead of on castings shipped, is $34 per ton. This figure is obtained by dividing the total cost, $4,100, by the amount of material melted, 120 tons.

Department Two

The costs in department 2 are grouped under three headings, productive labor, expense labor and miscellaneous expense, also the ratio of the two latter items to the expense for productive labor is computed. The expense labor being $800, and the productive labor $1,200 the former is clearly seen to be 66.7 per cent. of the latter; the sum of the expense labor and the miscellaneous expense is $1,600, or 13.3 per cent. of the productive labor.

Since we have assumed that 50 tons of castings are shipped, the melting loss per ton works out at $56. The total cost for productive labor for the month under consideration being $1,200, the average cost per pound is calculated to be 1.2 cents. The various ratios to productive labor are very important, since they are used in computing the factor F appearing in the estimating formula.

From the foregoing explanation it is clearly evident how the expenses in the three remaining departments, cores, cleaning and office, are calculated. In each of these cases the expenses are grouped under two principal heads, expense labor and miscellaneous.

Recapitulation

After the detailed expenses of each department have been worked out and the office expense properly proportioned among the other departments, the various totals are recapitulated, as indicated in the lower left hand corner of Fig. 1, and the ratio of all other expenses to the cost of productive labor in the moulding department is calculated. Using the figures which we have assumed this ratio is 296 per cent. The recapitulation, of course, does not include the melting department expenses, since the latter are dealt with separately in the estimating formula. As previously stated this formula is as follows:

$$\text{Cost per pound} = \frac{W\,P + L + F\,L}{W}$$

The price of the metal per pound, represented by P in the formula, is obtained from Fig. 1 under melting department expense, where it is given as $0.017 per pound. Fig. 1 also gives the average cost of productive labor in the moulding department as 1.2 cents per pound, and this may be used in computing the term L in the formula for any ordinary casting. In order, however, to have more specific information on this important matter separate records are kept giving the moulding time, and therefore the moulding cost of each job, with which new work may be compared. This is a more satisfactory method, since the average figure has only a limited application and is liable to lead to erroneous results if not properly applied. The individual records of moulding time indicate that the moulding time indicate that the moulding cost varies from $5 to $50 a ton. The factor F in the formula is obtained direct from the recapiulation in Fig. 1, and in this case is 296.

The application of the formula in connection with the cost quantities given in Fig. 1 may best be explained by an example. Assume for instance a connecting rod weighing 50 pounds. Assume also that the weight of the heads and rises is equal to 20 pounds, so that the total weight of the rough casting is 70 pounds. The cost of the casting is as follows:

$$\frac{W\,P + L + L\,F}{W} =$$

$$\frac{(70 \times 1.7) + (50 \times 1.2) + (60 \times 2.96)}{50} = 7.15$$

cents per pound.

No cost system is absolutely accurate and the efficient system is the one which gives the most accurate results at the least expense. It is thought that the system described herein is specially noteworthy for its accuracy combined with economy. This is an important characteristic, since a cost system which is not accurate is worse than none. In fact, it is probable that more managers are led astray by false statements found in their cost records than get into trouble through the lack of any system at all.

Of course the human element enters into this phase of the question, it requiring no little amount of moral courage to face the actual figures when business is going badly. It is very easy in such cases to juggle the cost items a little so that they will give a favorable appearance, but this is encouraging a practice of self-deception that is very dangerous.

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THE BRITISH MUNITIONS INVENTIONS DEPARTMENT

THE Munitions Inventions Department constituted by Lloyd George in August, 1915, has since its inception handled 35,000 cases, and it is interesting to note that the proportion of inventors who are dissatisfied is very small so carefully is the work conducted and so thoroughly is each item investigated for any idea of value to the country.

This department of the Ministry of Munitions deals with and considers inventions put forward by officers, non-commissioned officers and men, and by the general public for use in all military operations and equipment not connected with the navy.

Personnel

At the head of this department is an honorary advisory council of scientific, military and naval experts of the highest standing. The office staff consists of the comptroller, assistant comptroller, secretary, technical advisers, examiners, military advisers, draughtsmen and clerical staff.

When an invention is received by the department it is submitted to the examiner dealing with the particular class of inventions to which it belongs, and on his reporting it is then submitted to a committee of the advisory council. If an invention is found to have sufficient merit it is developed and tried out under actual service conditions and accepted or declined.

The advice of examiners, who are all technically trained men, the facilities of the drawing office and the workshop actually on the premises, together with those which are afforded by the experimental ground at Esher, and the assistance given by various scientific laboratories are all at the disposal of the inventor, and the department is thus enabled to afford him an amount of technical assistance which would be quite impossible to obtain elsewhere.

Patents and Rewards

There is attached to the department and housed in the same building a patents and rewards section whose duties consist of:

1. Investigating applications from officers, N.C.O's, and men, and of civilians employed by the government on war work for permission to take out patents.
2. Investigating claims for rewards and royalties where inventions have been adopted for the use of the Crown.

The address of the Munitions' Board of Inventions is Princes Street, London, S.W., and that of the Admiralty Board of Inventions. to which all matters pertaining to naval affairs should be referred is Victory House. Cockspur Street, London, S.W.

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THE number and size of electro-chemical industries at Shawinigan, Que., must increase rapidly in the future, because with 100,000 horse-power now available from the St. Lawrence River, as fast as plants can be erected to utilize it, and with over 600,000 horse-power yet untouched, and with its low power costs, cheap labor and advantages of export rates, it offers a strategic position for serving the European market, which for many years to come must be a large one. At the moment it is one of the few localities in the country where power in quantities can be obtained quickly and cheaply, and where the necessary labor for plant operation can be secured without excessive importation. With these present advantages and its future possibilities, it is almost certain that Shawinigan will continue to be the electro-chemical centre of the Dominion of Canada.

Principles and Methods of a New System of Gas Firing*

By A. C. Ionides

The researches of the author into combustion processes have yielded many valuable facts and the inception and development of the furnace described by him are particularly interesting. Not only the simplicity and ingenuity of the finished apparatus, but the economy of results obtained indicate the desirability of full development being accorded it.

THE author's method of heating with gaseous fuel dates from June, 1909, when he was carrying out an experiment preliminary to constructing a calorimeter for testing the calorific value of petrol air-gas. The experiment was to ascertain whether or not the flues could be downwardly displaced in a calorimeter, in order to avoid any possible loss of heat.

At that time silica glass was a new material, and it so happened that a little prior to this date this material was exhibited for the first time at the Royal Institution. A test tube, about ½ in. inside diameter and 6 in. long, and a piece of 1-16 in. bore silica glass tube about 8 in. long were acquired. Connecting one end of the silica-glass tube to the petrol air-gas by means of rubber tubing, the author ignited the mixture, and was astonished to find that it burnt, and continued to burn, in the upper end of the inverted test tube. Moreover, as the silica glass became hot, the flame either disappeared or became invisible, and the character of the combustion altered. The changed state of combustion continued indefinitely, and suggested that there should be no difficulty in transmitting the greater part of the heat units of the gas to the object to be heated. This experiment may be said to have established the fact that flues may with advantage be downwardly displaced.

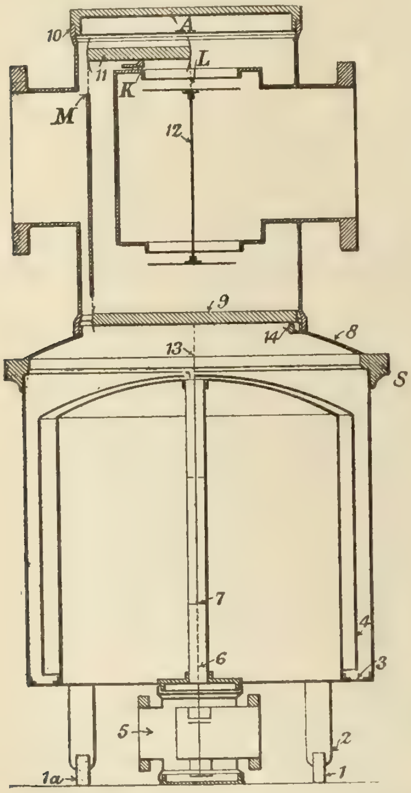


FIG. 1.—MIXING BALANCE. 1, 1a, levelling screws; 2, feet; 3, bell container; 4, sensitive bell; 5, gas-valve box; 6, gas connection to bell; 7, bell-rod guide; 8, cover to container; 9, main beam; 10, cover to air-valve box; 11, secondary beam; 12, double-beat air valve; 13, chain attachment to beam; 14, fulcrum for main beam.

The first problem that presented itself in applying this new principle was the difficulty of establishing and maintaining a constant mixture. There are three main variables to be dealt with as regards mixture: (1) The inlet pressure of the air; (2) the inlet pressure of the gas; (3) the variation in consumption of either air or gas that may occur in any given installation.

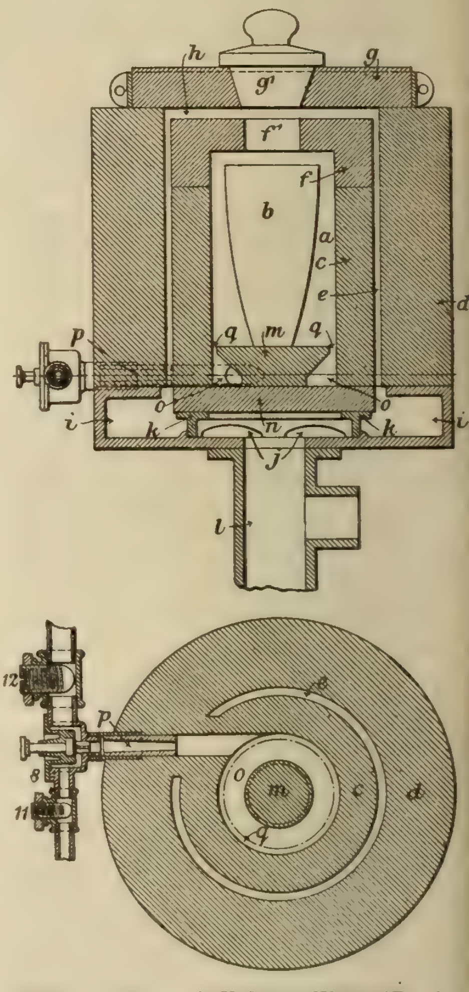
Control Device for Pressure

This first problem was most difficult of all to solve, since, for domestic purposes, etc., it was necessary to deal with differences of pressure sometimes involving a consumption of, say, 2.7 cub. ft. of gas per hour. Nevertheless, after a lapse of four years, this problem was solved by the construction of a device now known as a pressure balance.

It has been suggested that a better name would be a "mixing balance," and the author concurs in this view. This balance (Fig. 1) consists of a sensitive bell 4, with a requisite length of seal. The inside of this bell is subjected to the static pressure of the gas, and the outside to the static pressure of the air. It will be seen from the figure that when the static pressure of the gas increases, the arrangement is such that the flow of gas cuts itself off, and the flow of air is, to some extent increased; and likewise, when the static pressure of the air above increases it shuts itself off, and opens the gas correspondingly, and *vice versa* when the gas and air are decreased. And, it is to be observed, a similar cycle of operations takes place when the consumption of the one or the other is increased or decreased. Therefore, by such a device the pressures of gas and air are always held in a constant ratio, whatever be the variation of either the inlet pressure of gas or air, or the consumption.

If a mixture of gas and air be rich in gas, the flame is correspondingly lengthened. On the other hand, if the proportions approach 6 or 7 volumes of air to 1 of gas (according to the quality of the gas), it is quite possible, given silica or any other good catalyzer, to have no flame at all, but merely surface combustion. Now these conditions present great difficulties in heating with a neutral mixture—one which may be said to be neither oxidizing nor reducing—because of the tendency to local heating; and before this was finally and satisfactorily solved another three years had passed.

Should a good catalyzer be placed at right angles to a stream of well-proportioned mixture, a glowing disc will be observed. On the other hand, if all catalyzers in front of this stream are avoided, the combustion can be spread out to a very considerable length. The author has proved by experience that with a ¾-in. injector, or even with one of ½ in., it can be spread out to a length of 3 ft. of almost homogeneous combustion, by putting the injector into a channel of firebrick opened at the top, as in Fig. 2. In this way the heat units can be distributed in a furnace,



FIGS. 2 AND 3.—CRUCIBLE FURNACE. A, furnace chamber for containing a crucible; b, crucible; c, inner walls; d, outer jacket; e, flue space in between outer and inner jacket; f, collar with central aperture f1; g, cover with movable plug g1, resting on outer jacket d; h, space between f and g forming a communication through the aperture f1, so that the combusting gases vent themselves downwards through the annular space e, and pass thence through the hollow platform i, by way of the aperture j in the central supporting ring k, to the downward discharge pipe l.

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*Paper read before the Institute of Metals, London, September, 1917.

or boiler, or any other heating apparatus, in a very satisfactory manner.

Effect of Temperature Increase

The third point in the system under description resulted from an observation that the hotter the furnace grew the less was the consumption of gas. By taking into consideration the expansion of gases by combustion, some light is thrown on this phenomenon. What happens if the mixture enter the furnace at, say, normal temperature, 15 deg. C.? Obviously, if it act as a perfect gas, it will have expanded 1,700 ÷ (273 + 15), or 5¾ times its initial volume.

If the waste gases, instead of passing into a chimney open at the top, are displaced downwardly through a contracted exit of predetermined cross-sectional area, this will cause a resistance to the flow of incoming gases and provide the elements of the most refined thermostat, without any working parts. In fact, by these means the temperature to be maintained can be predetermined with a pencil and a piece of paper.

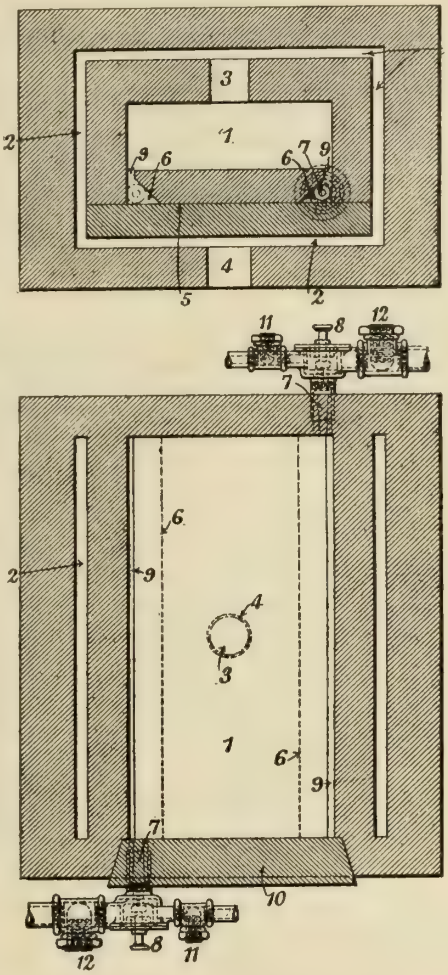
The fourth problem was how to determine the mixture. After many trials it would seem that the simplest plan is to fit an ordinary gas cock with a piece of copper tubing bent with an easy bend and enlarged at the farther end, and screwed into the injector in such a manner that the enlarged opening at the end of the copper tubing faces the central axis of the delivery pipe, in this way avoiding stream lines. Now, if a piece of india-rubber tubing and an incandescent mantle be fed with this mixture, the light will indicate the character of the mixture. If the meshes of the mantle are visible, it means an oxidizing mixture. If, however, the mantle is at its most brilliant point, the mixture will be very near the neutral point. On the other hand, if any unburnt gas is seen to escape from the mantle in the shape of a blue flame, the mixture will be an excessively reducing one. There is a further variable to which reference has not yet been made, and that is the quality of the gas. This can be provided for by external distribution. Let it be assumed that there is a mixing balance on the air and gas mains entering into a factory, and that all the injectors in the factory are properly calibrated and set for their various functions—brass-melting, steel-heating, illuminating, etc. When an unwelcome change in the quality of the gas occurs it is immediately visible on one of the lights. A regulating cock on the air main (preferably a screw-down tap) will at once put this right, and the whole of the factory will be compensated for this change in the quality of the gas.

Advantages of Employing These Principles

From what has already been said, it will be readily seen that the conditions of conducting heat operations of many kinds on these principles are cleanly, and extremely economical in fuel. But the economy is not only in fuel, but also in forgings. There is specially notable the facility with which a reducing or an oxidizing flame can be established and maintained, thus ensuring a consequent absence of scaling. Manufacturers have informed the author that they often have to scrap as much as 90 per cent .of their steel forgings owing to scaling. The figures given by perhaps the largest users of furnaces for steel forging in Europe, after testing, for five months, a furnace for forging machine-gun barrels, were:—

Saving, 50 per cent. to 55 per cent.

Scaling, negligible.



FIGS. 4 AND 5.—RECTANGULAR BARREL FURNACE. A heating chamber 1, having a door 10 at the front, is provided above and below, and, upon the greater portion of its sides, with jacketing flue spaces 2. The chamber 1 communicates by one or two central apertures 3 with the top flue space, and the heating elements passing through the said apertures pass downwards through the flues 2, and are finally discharged through the outlet pipe 4. In the bricks 5, forming the floor, there is provided along each of the two long sides a narrow combustion chamber 6, into which a nozzle 7 delivers mixture from a mixing device 8, provided with gas and air-adjusting means, 11 and 12. The long combustion chambers 6 each deliver the products of combustion by a long narrow slot 9 into the furnace chamber 1. The nozzle is positioned at one end of the long combustion chamber, so that the heating elements, due to their travel along the chamber and their upward motion to escape through the slot 9, enter the furnace chamber 1 with a diagonal movement parallel to the wall thereof. The gases passing along the wall will tend to turn at the angle when meeting the adjacent wall, and thus a whirling motion of the gases round the walls of the chamber will be created. If the nozzles for the two combustion chambers are arranged at opposite ends of the furnace, as shown, this whirling will be accentuated, the gases being gradually drawn inward across the roof of the furnace chamber on their way to escape at the outlet aperture 3.

Therefore, it is perhaps unnecessary to state that, even if there were no economy in fuel, there would still be a great saving with regard to steel forgings. A half-ton billet heating furnace has been made, and the figures given with respect thereto were—

Gas consumption, 1.3 cub. ft. per pound for full forging heat.

Scaling, negligible.

In Table I. is given a list of figures relating to 70:30 brass, melted in a 20-lb. crucible furnace. These figures speak for themselves, and show that in brass-melting an economy analogous to that afforded in steel forging can be effected. It might be added that Messrs. Vickers applied this system to a barrel-heating furnace 36 in. by 12 in. by 3 in. inside, which resulted in their coming to an agreement to establish this system throughout their works.

TABLE I.—GAS CONSUMED IN A 20-LB. CRUCIBLE FURNACE MELTING 70:30 BRASS.

lb. of 70:30 brass melted	From Cold C. Ft. Gas used	C. Ft. per lb.	Second Heat C. Ft. Gas used	C. Ft. per lb.	Third Heat C. Ft. Gas used	C. Ft. per lb.
12.56	42.0	3.36	. . .	. . .	. . .	. . .
15.0	51.0	3.4	. . .	. . .	. . .	. . .
16.0	52.0	3.25	. . .	. . .	. . .	. . .
20.0	66.0	3.3	. . .	. . .	. . .	. . .
16.0	60.0	3.75	. . .	. . .	. . .	. . .
19.0	55.5	2.89	. . .	. . .	. . .	. . .
20.0	55.0	2.75	. . .	. . .	. . .	. . .
19.75	. . .	. . .	40.0	2.1	. . .	. . .
14.0	. . .	. . .	. . .	. . .	27.0	1.92
20.0	58.0	2.9	. . .	. . .	. . .	. . .
20.0	53.0	2.65	. . .	. . .	. . .	. . .
20.0	. . .	. . .	36.0	1.8	. . .	. . .
14.0	. . .	. . .	. . .	. . .	. . .	2.08
20.0	56.0	2.8	. . .	. . .	. . .	. . .
20.0	. . .	. . .	41.8	2.09	. . .	. . .
19.5	77.5	3.98	. . .	. . .	. . .	. . .
20.50	. . .	2.83	19.25	2.0	18.50	1.86
20.0	. . .	. . .	28.5	1.4	. . .	. . .
20.0	56.0	2.8	. . .	. . .	. . .	. . .

As an indication of the correctness of the principles employed, the author would point out that a light worked by means of a pressure balance feeding a small incandescent mantle will produce 130 c.p. to 150 c.p., with a consumption of under 3 cub. ft. per hour of town gas of standard calorific value; whereas it can be stated, on the authority of Mr. J. G. Clark, that the highest candle-power light obtainable at this pressure by other systems averages 22 c.p. per cubic foot of gas consumed (variable, of course, owing to the atmospheric burner).

Economy Possibilities

To show the saving to the country that would be brought about by use of these devices, it may be recorded that:—

1. A 3-in. pressure balance saves 50,000 cub. ft. of gas, or 5 tons of coal per 10-hour day, compared with a Brown and Sharp furnace, which is considered by all small arms factories to be the best on the market.

2. One thousand of these devices, in the manufacture of which 240 tons of combined iron castings and steel sheeting would be required, would save in six months—*i.e.*, 180 ten-hour days—the gas distilled from 900,000 tons of coal.

3. Should the barbarous use of raw coal as fuel, which in itself is most wasteful, be discontinued, and this system be found to be equally economical with all forms of producer-gas as with town gas, then in this country alone, where 250,000,000 tons of coal are raised every year, these devices would save half this coal; or, in other words, they would double the industrial possibilities of England.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and
News of Foundrymen's and Allied Associations. Contributions Invited.

MOULDING A CURVED FLANGE

By J. Crowe

HAVING seen a question asked in a recent issue as to how to make a curved flange to fit a circle of any diameter the following article has been written giving a description of the method used in making a number of similar castings.

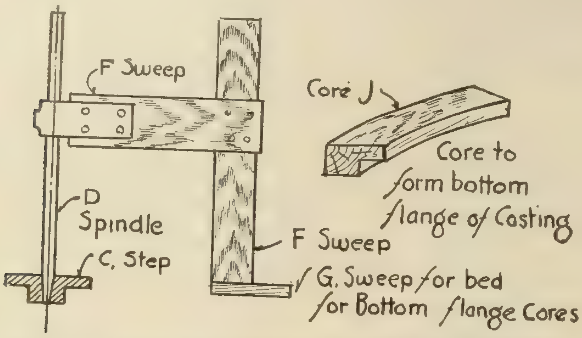

F Sweep
Core J
Core to form bottom flange of Casting
D Spindle
C, Step
F Sweep
G. Sweep for bed for Bottom flange Cores

FIG. 1. DETAILS OF SWEEP AND CORE FOR FLANGE.

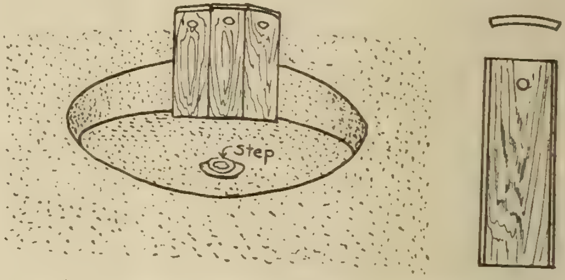


FIG. 4. SHOWING METHOD USED IN RAMMING UP CORE.

Select a place under the swing of the crane, dig a hole the required depth and place the step C and spindle D., Fig. 1, in the center with the sweep boards attached. Sweep the bottom bed of the casting and the bed for the cores J. Place the flange cores J to just clear the vertical board on the spindle and fill in the space underneath the cores with waste, paper or rope. Fill up with sand to whatever height is required to reach the bottom of the curved flange and place the boards A and B in the floor a foot clear each way of the casting.

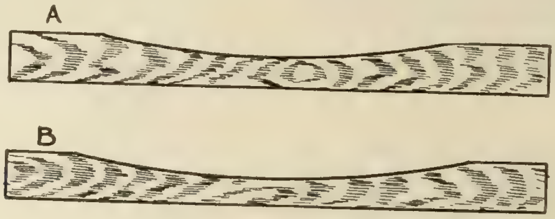


FIG. 2. BOARDS CUT TO THE CURVE OF THE FLANGE.

Strickle off as shown in Fig. 3 and make a false parting on this bed. Then raise boards A and B the required thickness for the flange. Put on the thickness with sand, make parting place cope on and ram up, lift off, finish and set aside.

Next dig out the mould in the floor inside of circle, place spindle in step and sweep out the thickness. Score the thickness of the curved flange on the vertical face just swept out and lift off the thickness of sand, using a segment to fix up the outside edge.

When complete place the three boards shown in Fig. 4 against the outside of the mould and ram up the core to the height required. Draw two boards at a time leaving the third one in position until the circle is completed; then take strickle board H and strike off along the curved boards A and B, close up and cast.

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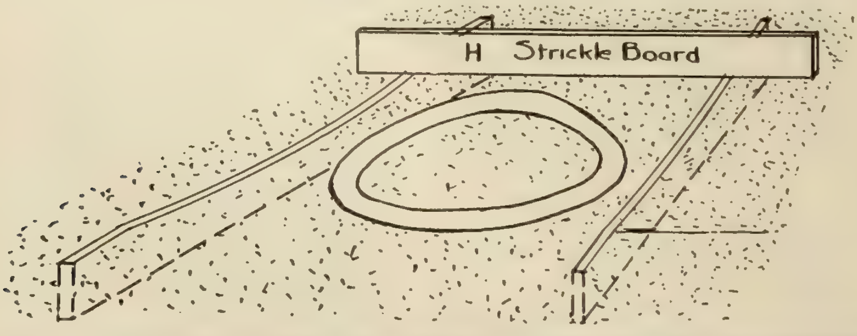


FIG. 3. BOARDS SET TO STRIKE OFF BOTTOM OF CURVED FLANGE WITH STRICKLE BOARD BEARING ON EACH.

PATTERN MAKING NOTES

By J. W. Broadbent

WHEN turning patterns on the face plate it is essential, in the majority of cases, to use an intermediate face plate of wood. The design and method of building up these wooden face plates are exceedingly numerous, some even approaching the ridiculous. The main idea is to have the face plate strong enough to hold the work to be turned and sufficiently stiff to prevent the possibility of warping and twisting out of shape; at least, during the period when the pattern to be turned is secured to the face plate.

Face Plate Construction

For small jobs up to 12 inches in diameter, a plain circular piece of wood from 1 in. to 1½ in. in thickness may be used, and if further strength is required a batten may be screwed to the back as shown in Fig. 31; this batten being wide enough to take the iron face plate. Fig. 32 illustrates a face plate suitable for turning work up to 24 inches in diameter, three or more boards being joined together with cross pieces. This face plate is simple and inexpensive, and at the same time will be found to be more rigid for practical use than one built up in a more elaborate manner. No glue should be used on the cross-bars of the face plates Fig. 31 and 32; screws alone being sufficient to hold the different sections firmly together and yet allowing the wood to swell or shrink with the changes of the temperature or the humidity of the atmosphere, without distorting the flat surface of the face plate to any appreciable extent.

Fig. 33 shows a sketch of a face plate built up of four segments glued and screwed to two cross-bars, these bars being joined together at the center by a half-lap joint as shown. This makes a very substantial face plate for work up to three feet in diameter, as it maintains its shape and is easily trued up. The cross-bars should be made out of stock 1½ in. thick and 4 in. wide, and the segments of 1¼ in. material. A face plate built up of sections as shown in Fig. 34 keeps its shape very well, but being rather heavy is not suitable for work over three feet in diameter. It is obvious that the joints of the sections in each course should overlap. For work of large diameter a face plate as illustrated in Fig. 35 is probably the strongest method of construction, the number of arms and segments being increased proportionately with the diameter of the plate; the one here shown is quite suitable for work up to eight feet in diameter.

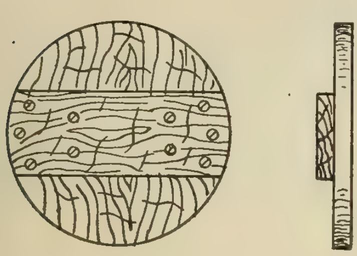


FIG. 31.

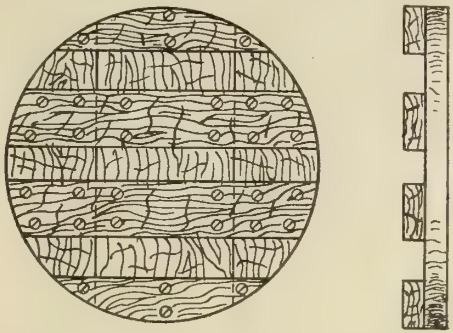


FIG. 32.

Rechucking of Work

There are very few examples of patterns which being turned on one side, and then removed from the face plate to be rechucked for operations on the opposite side, necessitate the mutilation of the face plate for the purpose of centering the work. When a rush job comes into the shop and there is no suitable face plate available, or the face plate has been turned down so thin that you could read a newspaper through it, there is a liability of language being used by the workman who is doing the rushing. The only sane method of rechucking work is to nail or screw several pieces of wood upon the flat surface of the plate, these being afterwards turned so that the job is a snug fit, and therefore centering itself sufficient to allow the holding screws to be driven.

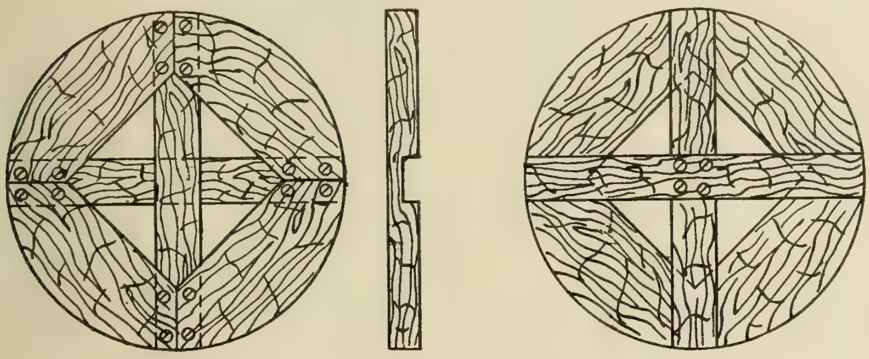


FIG. 33.

Turning Tools

The turning tools used by the pattern maker are not very numerous, and the best results are obtained by the use of those having a scraping rather than a cutting action. The only exception among the hand turning tools is the skew chisel shown in Fig. 36. It requires considerable skill to use this tool effectively, the cutting edge being held tangentially to the piece to be turned so as to get the real cutting action. For getting a smooth finish on the work this tool is admirable but for accuracy the scraping tool is to be preferred. The turning gouge with its rounded cutting edge is shown in Fig. 37, this tool being adapted for roughing down the work, and in the hands of a skillful operator very little finishing is required after using this tool. When turning hollows or fillets the gouge has a "mulish" habit of kicking, and for operations such as these the round nose Fig. 40 should be used. Fig. 38 is the square nosed tool for finishing flat surfaces, and Fig. 39 the spear point for end turning. Right and left hand side tools Fig. 41 should comprise part of the kit, and another very useful tool is shaped as in Fig. 42 which may be used for turning the inside of hollow patterns. It is a well known fact that if a crowbar is held against a rapidly revolving piece of wood that the crowbar will tear off chunks of wood, making the piece to be turned—in appearance—round. A well turned piece of wood is to be admired that the uninitiated look with a certain degree of wonder at the comparative ease with which the pattern maker manipulates his tools, producing the even, smooth surface so much desired in a good pattern. The secret of successful wood turning is in keeping the tools sharp and in good condition, and by no other means can a smooth finish be obtained.

◆

THE RETURNED SOLDIER AND INDUSTRY

BY no stretch of the imagination could anyone apparently conceive of greater problems than those with which the various national governments are confronted at the present time in the stupendous task of waging a war, the equal of which has never before been experienced in the history of mankind. It is small wonder that mighty men, of marvellous mental ability and physical accomplishments, endowed with almost miraculous stamina for achievement, have risen to great power and influential position, and, after a period of brief or prolonged administration, have been superseded by others, fresh for the fray.

With the world conflict still at its height, it seems premature to dwell on the possible developments that will undoubtedly arise when peace is finally declared and the nations take a breathing spell before resuming the task of supplying the needs of a normal and sane humanity. While it is certainly obvious that the successful solution of war problems requires the concentrated, and oftentimes superhuman efforts of the executives, in whose hands lies the destinies

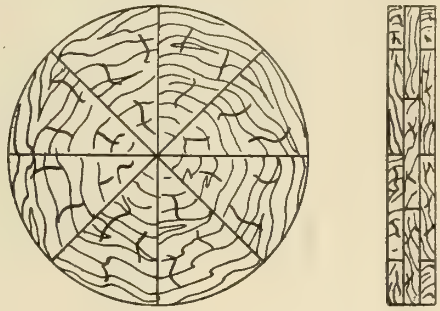


FIG. 34.

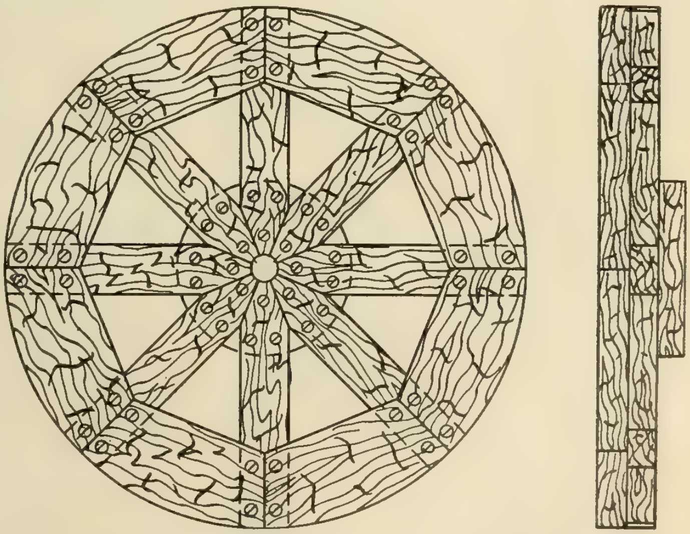


FIG. 35.

of nations, it is prophetically true that the period of commercial and industrial, as well as social, readjustment that must inevitably follow in the wake of such a devastating war, will create unprecedented conditions requiring the closest co-operation of statesman, manufacturer and employee, both individually and collectively, for their satisfactory settlement.

One of the most important, if not the all-essential problem of the immediate post-war period, will be that of the returned soldiers. Already this question is receiving the attention of many interested parties. Much has been accomplished, and still greater plans are being considered for absorbing these men into the normal channels of the country's future activities. The problem is not so much that of the man who has been fortunate enough to pass through the turmoil of the eventful past and return again with all his mental and physical abilities—as these men, in most instances, will be able to look out for themselves—but rather with the great number of men, temporarily or permanently disabled, who must rely on the honor and goodwill of those fellow citizens for whom this great sacrifice has been made. The care or employment of these men must not be considered as a charitable undertaking, but as a moral obligation on our part to which these men are justly entitled.

FIG. 36.

FIG. 37.

FIG. 38.

FIG. 39.

FIG. 40.

FIG. 41.

FIG. 42.

Without dwelling on the possibilities of after-the-war business, it is reasonably anticipated that many—in fact very many—of these men will eventually seek positions in that sphere of industrial life in which they were engaged previous to enlisting. It is probably here that patriotism will undergo its greatest test, to show whether our faith in these men has been overshadowed by the lust of a continuation of that prosperity that has only been possible through the trials and sufferings of these very men. These crippled or semi-disabled men will necessarily require some kind of employment to prevent them becoming a burden upon the various communities. Manufacturing establishments of every description should feel themselves obligated to employ several of such men when the occasion arises, and it should be the duty of executive heads to evolve factory methods whereby an armless or legless man would serve a purpose as well as one not thus afflicted. In order to employ these men in a capacity where their reduced ability will not detract from the general efficiency of a plant, it may be necessary for manufacturers to modify or readjust their existing equipments, or otherwise arrange the factory operation in order to provide suitable work at which they may prove as capable as others who are not minus some portion of their physical members.

One of the many details relative to factory operation, and one that is rapidly becoming recognized as an essential factor in economic plant management, is that of material transportation to and from the different machines and departments. Where modern and efficient methods are adopted for this particular purpose, the saving that has been effected has amply covered the initial cost of installation and subsequent maintenance. The mechanical improvements that have been made in the construction and operation of such facilities has almost eliminated the necessity of lifting heavy weights in and out of machines, or carrying same to different positions about the shop. It is this feature of factory operation that should form the foundation for the solution of the problem of the returned soldier. Not only would such labor-saving devices pave the way to a satisfactory settlement of the moral obligation, but it would undoubtedly result in greater plant efficiency. The accompanying illustrations show two automatic factory transportation trucks, the manipulation of which could be ideally handled by a legless or armless man almost as well as another not so handicapped. These trucks are so designed and constructed that there is no necessity for the operator to vacate his position on the operating platform, thus making it possible to so arrange the accommodation to conform to the specific requirements of the man in charge; by means of a suitable seat, men having lost a leg, or even two, would in time be able to manipulate one of these or similar trucks as well as anyone, the operation of the different control levers being the only physical exertion required.

It is in the adaptation of the automatic feature of factory facilities that will ultimately solve the most serious part of the returned soldier problem, especially in connection with the manufacturing industries.

◆

THE U. S. ZINC PRICES ARE NOW FIXED

War Industries Board Acts On Advice of Federal Trade Commission

WHEN fixing zinc prices, the U. S. War Industries Board issued the following statement:

"After investigation by the Federal Trade Commission as to the costs of production, the President has approved an agreement made by the War Industries Board with the producers of grade A zinc, fixing a maximum price of 12 cents per pound f.o.b. East St. Louis, subject to revision on June 1, 1918, and also an agreement made by the War Industries Board with the producers of sheet and plate zinc f.o.b.. plant, and 15 cents per pound for sheet zinc f.o.b. plant, subject to the usual trade discounts.

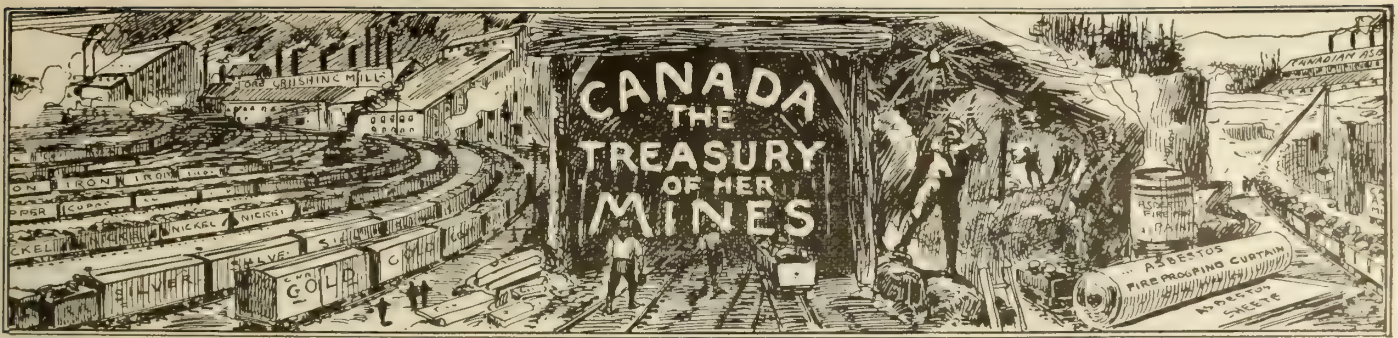
"The conditions are: First, that the producers of grade A and of plate and sheet zinc will not reduce the wages now being paid; second, that they will sell to the allies, to the public, and to the Government at the same prices; third, that they will take the necessary measures, under the direction of the War Industries Board, for the distribution of the zinc to prevent it from falling into the hands of speculators who might increase the price to the public, and fourth, that they pledge themselves to exert every effort to keep up the production of zinc so as to insure an adequate supply so long as the war lasts."

◆

NOVA SCOTIA OUTPUT

THE output of the Nova Scotia Steel and Coal Company for the three months to December 31 compares with production of the previous quarter as follows:

	Dec. 31, 1917	Sept. 30, 1917.
Coal, tons	135,273	139,795
Ore	36,111	7,174
Limestone	19,513	17,069
Coke	18,850	25,268
Pig iron	21,304	21,874
Steel ingots	29,216	30,845
Finished steel and forgings	25,199	22,657



PART 3.

The uncovering and reclamation of Canada's mineral resources contribute no insignificant chapter to her national development progress. The subject matter of the accompanying review prepared from official records for the Mail and Empire's Special Trade Expansion Number points to such a conclusion. Following a general reference to the Dominion production as a whole, the hidden wealth of each Province is discussed in its variety detail.

PROVINCE OF ALBERTA

The mineral resources of the province of Alberta being actively exploited include coal, natural gas, alluvial gold, clay and quarry products. Petroleum has been tapped although small in amount, and, notwithstanding the "oil fever" which was rampant in the province about three years ago, little progress has been made towards making any of the then discoveries real paying propositions. The oil is of light character, with a varying specific gravity. It grades from light green in color to colorless and has a paraffin base. Some of the product has been used in the crude state to run gasoline tractors.

The production of coal has increased very rapidly during the past few years which leads to the belief that Alberta will in the near future be the largest coal producer of all the provinces of the Dominion. Natural gas has been found over a wide area, while in the north there is an enormous tract of tar sands, the commercial value of which has perhaps not as yet been fully determined. Salt and gypsum are also understood to have been located.

Lignite, bituminous, and anthracite coal are each produced in the province, bituminous comprising over 50 per cent. of the output, lignite between 40 and 45 per cent., and anthracite less than 5 per cent. of the grand total. In 1912 Alberta became the second largest coal-producing Province, a position which it still holds. The output for 1916, the highest in its history, amounted to 4,563,020 of a total value of $11,496,106. It is of interest to note that the Province abounds with small operators, and because of so many new ones entering the field each year, the Department of Mines at Ottawa state that it is exceedingly hard to keep track of all of them. In 1915, there were 39 companies reporting a production in excess of 10,000 tons, their aggregate making nearly 93 per cent. of the total of the province. Eight of these reported an output of over 100,000 tons each, the largest operator being the Canadian Pacific Railway with a total of 541,567 tons from Bankhead and Lethbridge.

NORTHWEST TERRITORIES

The Northwest Territories as at present constituted include all that northern portion of Canada above the 60th parallel of latitude, extending from Hudson Bay on the east to the Yukon district on the west, and including all the northern Arctic Islands that belong to Canada. It is practically unpopulated, except for a few Indians and fur traders. Little is known of the country beyond what has been learned from a few explorations of some of the principal rivers. The occurrence of coal in the Mackenzie River Basin and of native copper in the Coppermine River district have been known for a long time.

Alluvial gold has been found in many of the streams, while the occurrence of iron ores, mica, graphite, salt, and gypsum have been noted. The northern part of this continent and the great Arctic Archipelago further north still contain large areas of the older rocks in which metalliferous and other minerals will no doubt eventually be developed, but in regard to which little is yet known. The area embraced by the Northwest Territories amounts to 1,242,224 square miles, and the population according to the 1911 Census totalled 17,196.

PROVINCE OF BRITISH COLUMBIA

The history of the mining industry of British Columbia is largely that of two well-defined periods—the era of pick and shovel mining, 1858 to 1878; and the era of machinery mining 1887 up to the present time. The first period opened with the Fraser River gold rush in 1858, and closed after the discovery of the Cassiar placers in 1874, and their subsequent exhaustion about the year 1878. This was an era of placer gold mining activity. While authorities vary in their estimates as to numbers, it may perhaps be within the mark to say that between April and June, 1858, some 20,000 persons embarked from San Francisco bound for the Fraser River diggings. The majority soon became disillusioned and disheartened, however. A million dollars represented the yield from the Cassiar field during the first year of operation, this being equivalent to over 50 per cent. of the aggregate production of the country.

Thenceforward, individually directed placer gold mining gradually declined, hydraulicing on a comparatively large scale being employed instead. In 1898 due to the discovery of gold-bearing gravels in what became known as the Atlin Lake Mining Division, individually directed placer mining again became active. In a short time, however, the majority of the claims were absorbed by syndicates and corporations, with the inevitable result that hydraulicing and dredging became the rule as it had done in the case of the Cassiar.

Annual Production of Graphite.

Calendar Year	Tons	Value
1886	500	$4,000
1887	300	2,400
1888	150	1,200
1889	242	3,160
1890	175	5,200
1891	260	1,560
1892	167	3,763
1893	Nil	Nil
1894*	3	223
1895	220	6,150
1896	139	9,455
1897	436	16,240
1898	...	13,698
1890	1,130	24,179
1900	1,922	31,040
1901	2,210	83,780
1902	1,095	28,300
1904	728	23,745
1904	452	11,760
1905	541	16,735
1906	387	18,300
1907	579	16,000
1908	251½	5,565
1909	864	47,800
1910	1,392	74,087
1911	1,269	69,576
1912	2,060	117,122
1913	2,162	90,282
1914	1,647	107,203
1915	2,635	124,223
1916	3,971	285,362

The second and more important period of mining activity dates from about the year 1887 and, as already remarked, it constitutes the machinery era. In July, 1890, all the more important mines of the Rossland camp, including Le Roi, War Eagle, and Centre Star, were located, and the following year witnessed the discovery of the extraordinarily rich silver-lead mines of the Slocan. Thenceforward, prospecting was vigorously prosecuted throughout the central and southern sections of the Province, the whole of which has proved to be more or less richly mineralised. Silver and lead were the first minerals to be marketed. The first production of copper was made in 1888-1889 from the Hall Mines near Nelson, a consignment of 100 tons of ore showing from 220.5 ounces of silver and 17 per cent. of copper, to 574 ounces of silver and 43.36 per cent. of copper per ton. Regular production did not actually commence until 1894.

Coal Mining Takes Precedence

Chronologically, coal mining takes precedence of all established enterprises on Canada's Pacific Coast, and is to-day, perhaps in point of tonnage, output and value, the most important of the mining industries of the Province. Coal was first discovered by servants of the old Hudson Bay Co. in 1835, but no developments of consequence took place until 1857 when the extensive coal measures at Nanaimo, Vancouver Island, where opened. The development of the coal mining industry proper, however, belongs to the second well-defined period of the history of the Province, since its rapid growth and expansion in the last 35 years is very largely due to the demands created by the new conditions arising from the development of metal mining. The newest and largest productive coal areas have been discovered during this period. The Crows' Nest Pass field was not exploited until 1897, and since then numerous other coal areas have been uncovered. The coal, generally, is bituminous and of excellent quality for domestic or steam raising purposes.

For many years, British Columbia was the premier mining Province of Canada, and was only displaced so far as output was concerned in 1907, when Ontario forged ahead. In a certain sense, our Pacific Coast Province is still of first importance owing to the fact that mining is probably its most important industry. The Province embraces a series of mountain ranges beginning at the "Rockies" which form the eastern border, and extend to the Pacific Coast. Coal and metalliferous ores including gold, silver, copper, lead, and zinc, together with clays, building stone, and gypsum, constitute the chief mineral resources. Antimony, platinum, and molybdenum, and mercury are also found.

With the exception of the placer gold mining of the Caribou and Atlin districts, active productive mining operations are confined principally to the extreme southern portion of the Province and to the districts on Vancouver Island and on the coast. Excluding placer gold, practically the entire mineral production has been obtained from that portion of the Province lying within 100 miles of the southern boundary, or within the area provided with transportation facilities.

Chief Centres of Activity

Among the chief centres of activity

Exports of Products of the Mine and Manufacture of Mine Products, Calendar Year, 1916.

PRODUCTS.		Quantity.	Value.
Arsenic	Cwt.	39,505	$ 197,458
Asbestos	Tons	96,775	3,872,463
Asbestos sand and waste	"	33,564	241,272
Coal	"	2,135,359	7,099,387
Cobalt (nine months only)		....	712,880
Chromite (Chromic Ore)	"	12,633	152,534
Corundum	"	56	8,583
Felspar, Magnesite, Talc, etc.		....	329,215
Gold-bearing quartz, dust, nuggets, etc.		....	18,382,903
Gypsum or plaster, crude	Tons	221,156	252,476
Metals, viz. :—			
Copper, fine, contained in ore, matte, regulus, etc.	Cwt.	1,249,424	20,776,536
Lead, metallic, contained in ore, etc.	"	90,484	558,180
Nickel, fine, contained in ore, matte, or speiss	"	804,417	8,662,179
Platinum, contained in concentrates or other forms	Ozs.	532	41,945
Silver, metallic, contained in ore concentrates, etc.	"	25,279,359	15,637,885
Mica	Lbs.	1,308,793	379,720
Mineral pigments, iron oxides, ochres	Cwt.	33,917	25,312
Mineral water, natural, not in bottles	Gals.	229	22
Mineral wax	Cwt.	80,987	201,653
Oil :—			
Mineral, coal and kerosene, crude	Gals.	137,647	11,439
Mineral, coal and kerosene, refined	"	446,595	48,137
Gasoline and naphtha	"	54,806	14,194
Ores :—			
Antimony	Tons	794	48,158
Iron	"	161,260	541,779
Manganese	"	957	89,544
Other	"	69,331	1,348,540
Phosphates	Tons	103	1,543
Plumbago, crude ore and concentrates	Cwt.	6,223	13,114
Pyrites	Tons	156,722	557,024
Salt	Cwt.	3,059	2,223
Sand and Gravel	Tons	1,114,913	388,309
Stone, ornamental, granite, marble, etc., unwrought	"	15,967	7,989
Stone, building, freestone, limestone, etc., unwrought	"	128,453	103,796
Stone, crushed	"	26,754	27,611
Stone, for manufacture of grindstones, rough	"	356	1,764
Other articles of the mine		....	17,694
Total mine products		....	$ 80,817,792
MANUFACTURES.			
Agricultural implements and machines, viz. :—			
Mowing machines	No.	6,672	$ 233,024
Cultivators	"	4,219	142.028
Reapers	"	1,115	65,011
Drills	"	4,713	317,831
Harvesters and binders	"	7,495	814.517
Ploughs	"	17,700	483,650
Harrows	"	6,691	97.214
Hay rakes	"	2,011	43.746
Seeders	"	2	128
Threshing machines	"	1,522	465.209
All others		....	292.603
Parts		....	750.966
Asbestos, manufactures of		....	4,714
Bricks	M.	1,746	13,942
Cement		....	2,424
Clay, manufactures of		....	58,550
Coke	Tons	48,539	221,334
Cream separators		....	34,567
Drugs, chemicals and medicines, viz. :—			
Acetate of lime	Cwt.	73.589	216.397
Acid, sulphuric	"	31,517	74,527
Calcium carbide	"	1,469,663	4,369,085
Phosphorus	Lbs.	834,950	122.323
Earthenware, and manufactures of		....	7.620
Fertilizers		....	3,338.413
Gasoline engines	No.	529	86,310
Grindstones, manufactured		....	43,179
Gypsum or plaster, ground		....	154,63[illegible]
Iron and steel and manufactures of, viz. :—			
Stoves of all kinds		....	29,956
Gas buoys and parts of		....	2,484
Castings, N.O.P.		....	167 881
Ferro-silicon and ferro compounds	Tons	22.802	1,352.013
Pig-iron	"	23,304	374,383
Linotype machines, and parts of		....	35.465
Machinery, N.O.P.		....	1,206 863
Sewing machines, and parts of		....	82.032
Washing machines, domestic, and wringers		....	5.763
Typewriters	No.	3,597	246,761
Scrap iron or steel	Cwt.	2,285,991	1,357,018
Hardware, viz. :—			
Tools, hand or machine		....	376.549
Wire, and wire nails	Cwt.	2,450,517	8.597.320
Hardware, N.O.P.		....	515,613
All other N.O.P.		....	88,974,154
Lead in pigs, etc.	Cwt.	1,121	7,710
Lime		....	66,406
Metals :—			
Aluminium in bars, blocks, etc.	Cwt.	184,253	5,201.066
Aluminium, manufactures of		....	26 780
Brass, old, and scrap	Cwt.	375.037	6,064.779
Copper, in pigs, bars, sheets, etc.	"	24.304	581 268
Copper, old and scrap	"	58,466	1,284 895
Metallic shingles and laths and corrugated roofing		....	30 563
Plated ware, N.O.P.		....	15.050
N.O.P.		....	3,143.135
Mineral and aerated waters in bottles		....	1.576
Oil, N.O.P.	Gals.	3,391,857	1,038.025
Plumbago, manufactures of		....	304.919
Stone of all kinds, dressed		....	4.592
Tar		....	50.352
Tin, manufactures of		....	16.284
Vehicles :—			
Automobiles	No.	12,579	6,078.668
Automobiles, parts of		....	672.060
Bicycles	No.	580	50 894
Bicycles, parts of		....	5.877
Total manufactures		....	$ 90,043.122
Grand total		....	$171,240,911

are included the coal mines of the Crows' Nest Pass in Eastern Kootenay which produce over 50 per cent. of the provincial coal output. Silver-lead and zinc ores have been extensively mined at Marysville, Moyie, Ainsworth, Slocan, Sendon, Silverton, and other points in East and West Kootenay, while to the south at Nelson and Rossland gold and copper are the principal values in the ores mined. At Sheep Creek in the Nelson division is an important gold camp in which the ores are mainly free milling. Further west in the area known as the Boundary District, low grade copper ores carrying gold and silver values have been found in very large deposits from which the annual production has ranged between one and two million tons. At Hedley there is located perhaps the most important gold mine in the Province. On the coast, copper ores are mined at Britannia Bay, Texada Island, and at Granby Bay or Anyox.

Mineral Production by Provinces, 1915 and 1916.

	1915.		1916.			
	Value of Production	Per cent. of total	Value of Production	Per cent. of total	Increase (+) or Decrease (—).	
Nova Scotia	$ 18,088,342	13.19	$ 19,963,985	11.26	+ $ 1,875,643	10.37
New Brunswick	903,467	0.66	878,446	0.49	— 25,021	2.77
Quebec	11,619,275	8.48	14,397,909	8.12	+ 2,778,634	23.91
Ontario	61,071,287	44.54	80,379,352	45.32	+ 19,308,065	31.62
Manitoba	1,318,387	0.96	1,819,921	1.03	+ 501,534	38.04
Saskatchewan	451,933	0.33	583,708	0.33	+ 131,775	29.16
Alberta	9,909,347	7.23	13,336,702	7.52	+ 3,427,355	34.59
British Columbia	28,689,425	20.92	40,191,744	22.66	+ 11,502,319	40.09
Yukon	5,057,708	3.69	5,805,687	3.27	+ 747,979	14.79
Dominion	$137,109,171	100.00	$177,357,454	100.00	+ $40,248,283	29.35

Vancouver Island possesses the oldest and most important coal mines as well as important metalliferous deposits. The Hazelton district has in recent years come to the front as a mineral centre. Prospecting and development is being undertaken at many points on or near the coast, while due to the construction of the Grand Trunk Pacific Railway access has been provided to hitherto untapped mineral territory. Important smelting industries have been established at Trail, Grand Forks, and Greenwood, in the southern interior, the fuel for which is provided by the coal mines of the Crows' Nest, or of Alberta. A new copper smelting plant started operation at Anyox in March, 1914.

Pig Iron in Canada

MONTHLY PRODUCTION, EXPORTS AND IMPORTS (IN SHORT TONS).

	Production.		Exports.		Imports.	
	1916.	1917.	1916.	1917.	1916.	1917.
January	562,097	89,187	1,635	106	4,456	5,473
February	†......	83,801	1,393	732	4,101	3,502
March	†......	103,789	2,725	1,394	5,602	7,442
April	†......	101,564	80	629	5,963	5,916
May	†......	108.799	30	966	6,489	7,189
June	†......	99.858	221	1,483	3,190	9,336
July	92.012	97,047	394	1,823	3,773	7,412
August	87.864	110,624	3,902	1,885	3,961	5,624
September	102,744	100,638	1,534	1,998	5,001	1,945
October	113,608		4,344		5,933	
November	104,436		4.055		3,310	
December	106,496		2,991		6,351	
Total	1,169,257		23,304		58,130	
Monthly average	97,438	99,478	1,942	1,135	4,919	5,982

†Monthly average of 93,688.

Since the latter year, and arising from the necessity that we should supply to the fullest extent possible the metal requirements of our intensive munitions industry, additional smelting and refining plants have been in process of establishment and are being now gradually developed into front rank producers. With a view, however, to a better grasp being had of the capacity provision now available for treating the various ores recovered, a detail embracing all Canada follows a little further on.

YUKON TERRITORY

The Yukon Territory, which geographically is a continuation of the Rocky Mountain range extending north-westerly from the 60th degree of Latitude; the northern boundary of British Columbia to the 141st Meridian; and the Alaska boundary, became famous on account of the Klondike gold fields located in the vicinity of Dawson on the Yukon River. Placer gold is still the principal mineral product, although there is an interesting output of copper and silver ores, and of coal, the district possessing important areas of the latter. Gold ores and ores of copper, silver, lead, and antimony, have been found widely distributed, and without doubt, the region possesses enormous mining possibilities.

The first reference to the occurrence of gold in the Yukon appears in a book published in London in 1869, the author, F. Whymper, cursorily mentioning the discovery by Hudson Bay Co. men of minute specks of gold, and adding "but not in quantity to warrant a rush to the locality." In 1878, a prospector named Holt made a journey to Teshintoo and reported having found coarse gold, but his statements were not confirmed by miners who afterwards prospected the locality. It was not until 1881 that the first discovery of paying placers was made by a party of four miners who ascended the Big Salmon River for about 200 miles, and found gold along its course and in the river bars.

Steel in Canada

MONTHLY PRODUCTION, EXPORTS AND IMPORTS (IN SHORT TONS).

	Production of Steel Ingots and direct Steel Castings.		**Exports.		*Imports.	
	1916.	1917.	1916.	1917.	1916.	1917.
January	589,553	130,990			4,212	13,322
February	†......	120,629			7,288	15 213
March	†......	152,420			5 206	32,590
April	†......	139,669		4,372	10 877	19,792
May	†......	155,346		4,811	8 542	26.823
June	†......	137,695		5,788	11.368	31,700
July	100,817	137,531		7,203	10.742	6,761
August	107,273	144,243		5,405	13,412	4,735
September	113,411	147,260		4,736	10.433	
October	123,469				12 958	
November	124,431				12,723	
December	116,265				10,309	
Total	1,275,219				118 070	
Monthly average	106,268	140,576		5,386	9,839	16,772

*The figures given hereunder represent the exports of steel, ingots and billets from the United States to Canada, and are compiled from the monthly reports of "Foreign Commerce and Navigation of the United States," Washington, D.C. The total exports to Canada during the eight months ended August 31, 1917, were 150,946 short tons, valued at $10,670,739.

**Exports of ingots or billets, not separately recorded previous to April, 1917.

†Monthly average of 98,259.

During the next few years exploration of other sections of the territory were undertaken, and gold was found on Fortymile Creek on the upper part of the Lewes River, and on the Upper Pelly. In 1887, some 250 miners were engaged in working claims or prospecting in the Upper Yukon. It was not until 1894, however, that the Klondike district was discovered by the finding of gold in Quartz Creek, while a year later, discoveries were made on Goldbottom, a tributary of Hunker Creek; in 1896, the phenomenal richness of Bonanza Creek was made known.

This discovery was followed by the historic excitement of 1897-1898, when a stream of adventurers from all parts of the world flowed into the territory. In 1900 the production of gold amounted in value to $22,000,000. From that year, however, it has gradually declined, the latest available returns, those for 1916, showing a value of $4.391,669 only. The goldfields are included in an area of about 800 square miles, bounded by the Yukon River on the west, the Klondike River on the north, by Flat Creek, a tributary of the Klondike River, and Dominion Creek, a tributary of the Indian

Manufacturers of Oven Coke.

Operator.	No. of Ovens and Type.		Location of Ovens.
*	45	Bee-Hive	Stellarton, N.S.
Intercolonial Coal Mfg. Co.	36	"	Westville, N.S.
*	97	"	Londonderry, N.S.
Nova Scotia Steel & Coal Co.	150	Bernard (120) Bauer (30)	Sydney Mines, N.S.
Dominion Iron & Steel Co.	620	Otto Hoffman	Sydney, N.S.
*	100	Bee-Hive	Port Arthur, Ont.
The Algoma Steel Corp.	110	Koppers	Sault Ste. Marie, Ont.
*Hamilton By-Product Coke Ovens.		(Proposed)	
International Coal & Coke Co.	216	Bee-Hive	Coleman, Alta.
*West Canadian Collieries	50	Bernard	Lille, Alta.
*Leitch Collieries	101	Mitchell	Passburg, Alta.
Crow's Nest Pass Coal Co.	454	Bee-Hive	Fernie, B.C.
Crow's Nest Pass Coal Co.	486	"	Michel, B.C.
*	240	"	Hosmer, B.C.
Can. Collieries (Dunsmuir)	150	"	Union Bay, B.C.

River, on the east, and by the Indian River on the south.

In addition to the gold output noted above for the year 1916, there were produced 360,466 ounces of silver valued at $236,686, and approximately 3,980,640 pounds of copper.

CANADA'S FUTURE MINERAL PRODUCTION

From what has preceded, it will have become apparent that in the last quarter century, if not throughout the full fifty and a half years of Confederation, quite marked progress has been made in the uncovering of Canada's mineral resources, and while it goes without saying that development will grow in intensity and be supplemented by even greater and richer discoveries as the years come and go, there must be neither hesitancy nor indifference shown as to the primary disposition of the various products. Powerful influences are now at work with the idea of ensuring that to the utmost limit mineral matter recovered shall be reduced and converted into marketable commodities by factories of one kind or another within our own borders and while, during these three war years,

Most Recently Compiled Detail of Ca nadian Metallurgical Works

Iron Blast Furnaces.

Company.	Location of Plant.	Number of Furnaces	Rated Capacity of Completed Furnaces
NOVA SCOTIA.			
Dominion Iron & Steel Co.	Sydney, C.B.	Six completed	1,680 tons per day
Nova Scotia Steel & Coal Co.	Sydney Mines, C.B.	One "	250 " "
†Londonderry Iron & Mining Co.	*Londonderry	One "	100 " "
ONTARIO.			
Algoma Steel Corporation	Steelton	Three "	1,064 " "
Atikokan Iron Co.	*Port Arthur	One "	175 " "
Canada Iron Foundries, Ltd.	Midland	Two "	375 " "
Canadian Furnace Co.	Port Colborne	One "	225 " "
Standard Iron Company of Canada, Ltd.	Deseronto	One "	67 " "
Standard Iron Company of Canada, Ltd.	Parry Sound	One "	67 " "
Steel Company of Canada, Ltd.	Hamilton	Two "	690 " "

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†In liquidation.

Ferro-Alloys.

Company.	Location of Plant.	Products.
QUEBEC.		
The Electric Reduction Co.	Buckingham	Ferro-phosphorus (electric furnace).
ONTARIO.		
Electro-Metals, Ltd.	Welland	Ferro-silicon (electric furnace).

Steel Furnaces.

Company.	Location of Plant.	Furnaces.
NOVA SCOTIA.		
Dominion Iron & Steel Co.	Sydney, C.B.	(Ten 50-ton basic open-hearth furnaces. (Three 15-ton Bessemer basic converters. (Three metal mixers (one 300-ton, two 350-ton).
Nova Scotia Steel & Coal Co.	Sydney Mines, C.B.	Four 40-ton and one 50-ton basic open-hearth
Londonderry Iron & Mining Co.	*Londonderry	One 5-ton basic open-hearth.
QUEBEC.		
Armstrong-Whitworth of Canada, Ltd.	Longueuil	(Four 12-pot crucible furnaces. (One 3-ton Heroult electric furnace.
Canadian Steel Foundries, Ltd.	Longue Pointe	Three 30-ton acid open-hearth furnaces.
Canadian Steel Foundries, Ltd.	*Pt. St. Charles	Two 15-ton acid open-hearth furnaces.
Thos. Davidson Mfg. Co.	Montreal	One 1-ton Snyder electric furnace.
Canada Cement Co.	Montreal	Four 6-ton electric furnaces, 3 phase arc type.
Standard Steel Co.	Montreal, Hutchison & AtlanticSts.	One 1½-ton Baillot special converter.
Canadian Brake Shoe Co.	Sherbrooke	(Four 2½-ton and one 1-ton electric furnace.
F. X. Drolet Co.	Quebec	(One 2-ton Snyder electric furnace.
Beauchemin & Fils	Sorel	One 1½-ton acid Baillot converter.
Joliette Steel Co.	Joliette	Two converters.
Hull Iron & Steel Foundries	Hull	One 1½-ton converter.
ONTARIO.		
Algoma Steel Corporation	Steelton	Three 2-ton converters. Two 40-ton, three 45-ton, two 50-ton basic open-hearth furnaces and one 300-ton mixer. Two 5-ton Bessemer converters, 150-ton mixer. One 20-ton Bessemer converter, and one 200-ton tilting basic open-hearth furnace for duplexing.
Canada Steel Foundries	Welland	One 20-ton and one 25-ton basic open hearth furnace.
Dominion Steel Foundry Co.	Hamilton, Depew St.	Two 20-ton, one 20-ton acid open-hearth furnaces, and one 2-ton converter.
Steel Co. of Canada	Hamilton	200-ton metal mixer and ten basic open-hearth furnaces (two 25-ton, five 50-ton and three 80-ton).
Electric Steel & Metal Co.	Welland	One 5-ton and one 6-ton Heroult electric furnaces.
Moffat Irving Steel Works	Toronto, 400 Wellington E.	One 1½-ton electric furnace.
Tivani Electric Steel Co.	Belleville	One 1-ton electric furnace.
Swedish Crucible Steel Co. of Canada	Windsor	Three 4-pt. crucible furnaces and one 2-ton converter.
Wm. Kennedy & Sons	(Owen Sound	One 2-ton Tropenas converter.
	(Collingwood	Two 15-ton acid open-hearth furnaces.
Wabi Iron Works	New Liskeard	One 1-ton Heroult electric furnace.
BRITISH COLUMBIA.		
Vancouver Engineering Works	Vancouver	One 2-ton converter.
Port Moody Steel Works	Port Moody	Two 15-ton basic open-hearth furnaces (under construction).

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*Idle during 1915.

Rolling Mills.

Company.	Location of Plant.	Products.
NOVA SCOTIA.		
Canadian Car & Foundry Co.	Amherst	Bars and rods (iron and steel).
Dominion Iron & Steel Co.	Sydney	Billets, rails, wire rods, bars, angles, etc., wire and wire nails.
Nova Scotia Steel & Coal Co.	New Glasgow	Billets, plates and sheets, rails, bars and angles, etc., angle splice bars, nails and spikes, forged products.
Starr Mfg. Co.	Dartmouth	Iron bars.
NEW BRUNSWICK.		
Portland Rolling Mills	St. Johns	Bars.
QUEBEC.		
Armstrong-Whitworth of Canada	Longueuil	Taps, dies, milling cutters, gauges, special tools.
*Canadian Rolling Mills Co.	Montreal	Iron and steel bars.
Grand Trunk Rolling Mills*	Montreal	Iron bars.
*Peck Rolling Mills	Montreal	Bars.
Steel Co. of Canada	Montreal, Notre Dame	Billets, plates and sheets, bars, nails and spikes, wire, horse shoes (steel and iron), iron bars.
Steel Co. of Canada	Montreal, St. Patrick St.	Sheets and plates, bars, nails and spikes, iron horse-shoes, iron bars.
ONTARIO.		
Algoma Steel Corporation	S. Ste. Marie	Billets, rails, bars, angle splice-bars, fish-plate, etc.
Burlington Steel Co.	Hamilton	Bars and rods.
Canadian Steel Foundries	Welland	Billets and bars.
Wm. Kennedy & Sons	Collingwood	Billets, wire rods and bars.
London Rolling Mills Co.	London	Iron and steel bars.
Steel Company of Canada	Belleville Works	Iron and steel bars, spikes and horse-shoes.
Steel Company of Canada	Hamilton Works	Billets and wire rods, bars and rods, nails and spikes, forged products.
Steel Company of Canada	Hamilton, Ontario	Bars, fish-plate, tie plate, etc.
Steel Company of Canada	Fort William, Superior	Wire and wire nails.
Canadian Horse Shoe Co.	Hamilton	Horseshoe bars.
MANITOBA.		
*Manitoba Rolling Mills Co.	Selkirk	Iron bars.
ALBERTA.		
Alberta Rolling Mills Co.	Medicine Hat	Bars, balls and nuts.
Redcliff Rolling Mills & Bolt Co.	Redcliff	Bars.
BRITISH COLUMBIA.		
*Port Moody Steel Works	Port Moody	Iron bars.

*Idle or not reporting during 1915.

Nickel Copper Smelters.

Company.	Location of Plant.	Number of Furnaces, Capacity and Products.
ONTARIO.		
Canadian Copper Co.	Copper Cliff	Seven furnaces with capacity of 3,000 tons of ore per day, five basic converter stands. Two McDougall reverberatories, four wedge roasting furnaces. Product Bessemer matte.
Mond Nickel Co.	Coniston	Three furnaces with capacity of from 1,600 tons to 1,800 tons of ore per day, three Pierce-Smith Standard basic converters. Product Bessemer matte.

Copper Smelters.

BRITISH COLUMBIA.		
British Columbia Copper Co.	Greenwood	Three furnaces with capacity of 2,000 tons of ore per day; converter plant of two stands and seven shells with daily capacity of 35,000 lbs. of blister copper.
Cons. Mg. S. Co. of Canada	Trail	Five furnaces with capacity of 3,000 tons of ore per day, two Great Falls type converters and electrolytic refinery with daily capacity of 10 tons refined copper under construction.
Granby Cons. Mg. S. & Power Co.	Grand Forks	Eight furnaces with capacity of 4,000 tons of ore per day; three converter stands, and ten shells with daily capacity of 100,000 pounds of blister copper.
Granby Cons. Mg. S. & Power Co.	Anyox	Four furnaces with capacity of 3,000 tons of ore per day; two Great Falls type converters. Product blister copper.
*Tyee Copper Co.	Ladysmith	Two furnaces with capacity of 500 tons of ore per day. Product copper matte.

Lead Smelters.

ONTARIO.		
*North American Smelting Co.	Kingston	Two small furnaces with capacity of 50 tons per day; idle since 1913.
BRITISH COLUMBIA.		
Cons. Mg. & S. Co. of Canada	Trail	Four lead furnaces and electrolyte refinery with capacity of 125 tons of refined lead per day. Products: pig lead pipe, fine gold, fine silver, copper sulphate and antimony.

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*Idle during 1915.

Zinc Smelters.

Company.	Location of Plant.	Number of Furnaces, Capacity and Products.
ONTARIO.		
Electro Zinc Co.	Welland	Small plant for recovery of refined zinc from zinc oxide.
BRITISH COLUMBIA.		
Cons. Mg. & S. Co. of Canada	Trail	Electrolytic plant being installed with initial capacity of about 45 tons of spelter per day, which has been increased to approximately 70 tons per day.
French Complex Ore Reduction Co.	Nelson	Experimental development.

Aluminium Reduction Works.

QUEBEC.		
The Northern Aluminium Co.	Shawinigan Falls	Using Hall electrolytic reduction process. Products: Aluminium ingots, bars and wire.

Silver-Cobalt-Nickel Reduction Works.

ONTARIO.		
Coniagas Reduction Co.	Thorold	Products: Metallic cobalt, nickel and arsenic, white arsenic, cobalt and nickel oxides, cobalt and nickel sulphates and other cobalt salts and cobalt alloys.
Deloro Smelting & Refining Co.	Deloro	
Metals Chemical Co.	Welland	
Standard Smelting & Refining Co.	Chippewa	

Cobalt District Customs Concentrators and Reduction Works.

ONTARIO.		
Dominion Reduction Co.	Cobalt	Cyaniding, producing silver bullion.
Northern Customs Concentrator	Cobalt	Ore concentration only.
Nipissing Mfg. Co.	Cobalt	Cyaniding, producing silver bullion.

British Columbia Customs Concentrators.

BRITISH COLUMBIA.		
Kootenay Ore Treatment Co.	Kaslo	Products: Lead and zinc concentrates.
J. P. Keane	Roseberry	Products: Lead and zinc concentrates.

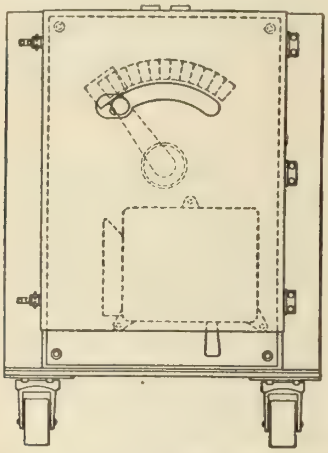
achievement towards the end indicated has been highly creditable, its good effect will be entirely lost were we to cease to maintain and strengthen determinedly so vital a requirement of our national well-being.

Canada's Metallurgical Works

It is the writer's opinion that mining and manufacture have not gone hand in hand as they should, in the past, and that as a result, both have suffered in progress and development. The outlook is for a greatly improved condition in this respect, and is traceable to the single-purpose idea of boosting Canadian industry. In order to familiarize readers with the chief manufacturing resources of the Dominion which are allied with mines and minerals, the most recently compiled and authoritative detail is included.

PORTABLE OUTLET PANELS FOR ELECTRIC WELDING SERVICE

FOR an electric welding outfit to be of its maximum service, it must be so arranged that it can be taken to the work no matter where it may be located. For instance, in a railroad shop there should be outlets adjacent to each stall in the roundhouse, one or more on the washing tracks outside and others in places through the shop. In a boiler shop there should be an outlet on every other column and in a large machine shop there should be an outlet adjacent to each of the larger machines in order that work may be done in filling up blow holes and other defects on large castings with the minimum amount of crane handling.


PORTABLE OUTLET PANEL FOR ELECTRIC WELDING SERVICE

One solution of the problem would of course be to locate a panel outlet of a suitable type wherever it is anticipated that electric welding might be desired. However, this is rather an expensive proposition and many electrical engineers would prefer to accomplish the same result in a simpler manner. The accompanying engraving shows a recently developed portable outlet manufactured by the Westinghouse Electric and Manufacturing Company which takes care of this situation with a minimum of expense and with all the simplicity of the familiar distributing system for storage battery charging.

Two types of portable outlet panels are furnished, both being mounted on light trucks. They consist of a control panel mounting a handle trip railway type circuit breaker having overload release with magnetic blowout, and a 13-point face plate connected to a resistor mounted in the rear of the panel. The face of the panel is protected by a metal cover through which the handles of the rheostat and circuit breaker project. The resistor is made up of grids and is protected by a cage of expanded metal. Type E panel is intended for metal electrode welding, only, having a capacity of from 80 to 170 amperes. With this outfit one metal electrode holder and one shield are supplied. For a wider range of work a Type F panel should be used. This will handle metal electrode work from 80 to 160 amperes, and light graphite electrode work up to 300 amperes. The outfit includes one metal electrode holder, one graphite electrode holder and one mask.

In installing an electric welding system using these portable panels, the best method is to place the arc welding motor generator set at some central point. Where suitable low resistance ground connection can readily be made throughout the shop, as for instance, where metal floors or cast iron bedplates are in general use or in a railway shop where the track system can be used, only one connector need be extended to the various receptacles. The iron floor plates may be arc-welded to each other and isolated sections tied together by an iron rod or heavy copper cable, while the track rails may be bonded by arc-welding the fish plates to the rails. Receptacles should then be provided at suitable points throughout the shop of a capacity appropriate for the service for which they are intended. These receptacles may readily be mounted out of doors if they are provided with protection from the weather. Only single pole receptacles and a single wire cable to the portable panel need be provided. This cable should be of sufficient length so that the panel may be placed as near as possible to the work in order to save steps and valuable time for the welding operator. The flexible cable leading from the panel to the electrode holder should be as short as is consistent to the class of work to be done.

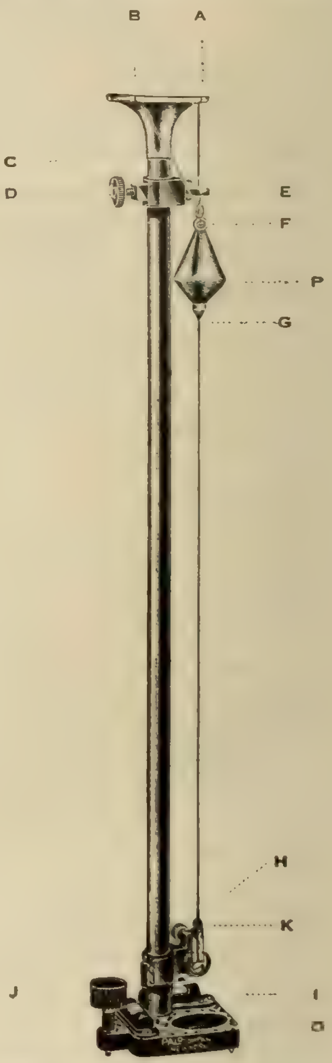
Where metal floors or tracks are not available, the ordinary two-wire system of distribution with double-pole outlets and two-wire cables should be provided.

A PORTABLE HARDNESS TESTER

INSTRUMENTS for testing the hardness of metal by actual deformation of the surface of the test piece are usually limited to laboratory installations and are heavy. The Waldo hardness tester as supplied by the Palo Company of New York, is unique in this respect, that it is portable and it is claimed still secures accurate and invariable results under any condition of service.

The accompanying illustrations show the apparatus necessary for making the test, comprising the test machine proper, and the small portable microscope for measuring the diameter of the indentation.

The device consists of a plummet weighing one-tenth of one pound, and falling one foot to the surface of the material whose hardness is to be measured. This plummet P shown in illustration has a conical, replaceable, chill-tempered, 60 degree, steel point G, of which several are furnished with each instrument. This plummet has tried to its upper extremity a very thin silk thread which bends over a funnel-shaped end piece A,B,C, into which, at A and B, slotted holes are cut with burnished edges so that the silk thread passes through them with practically no friction loss. The funnel A, B, C, turns with a slight friction in the end of the jointed supporting brass tube I, C. The silk thread is attached to a small burnished ring at its lower end, which ring in turn is caught in a little trigger at K, which can be released by the thumb screw H without jarring the instrument. The silk thread then passes from the release catch K through the hole A, through B, through an adjustable third hole at E, which is clamped in place by the thumb screw D so that the plummet point G is exactly over the aperture O in the base of the instrument.

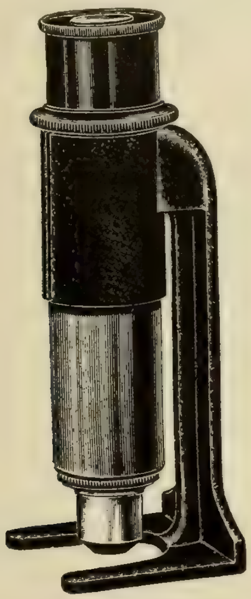


PORTABLE HARDNESS TESTER.

The base of the instrument is supported on three points, two of which are controlled by levelling screw J. Small cross levels indicate the verticality of the supporting rod I, C.

In use, the instrument is set on the surface of the material whose hardness is to be tested, so that the aperture in its base O is concentric with the exact spot to be tested. The plummet is then hung as shown, and lowered by holding the silk thread by its ring between the fingers so that the exact position of the clamp D,E, may be found for insuring the vertical fall of the plummet. This being determined, with the instrument levelled, the thread ring is placed in its releasing trigger K, and with the plummet in its position F, G, the funnel support A, B, is gently turned until the distance from the conical point G to the surface of the material to be tested O, is exactly one foot. The instrument is now ready for use.

A convenient way of stopping any slight swinging motion of the conical point G is to touch it gently with a small camel's hair brush or a piece of cotton wool. The instant the plummet is still, the trigger is released by the thumbscrew H, and the plummet falls, making a uniform circular indentation in the material tested. The object in releasing the plummet from the bottom of the apparatus is to avoid any disturbance in its upper support. The entire operation consumes but a few seconds after a slight experience with the instrument. The microscope is designed so that it has sufficient illumination and magnifying power to measure easily with an eyepiece micrometer the diameter of the impression made by the falling plummet point. The average diameter of the circular depression is then measured. Scale for measuring indentations is embodied in the microscope.



MICROSCOPE FOR USE WITH HARDNESS TESTER.

SUGGESTIONS AS TO THE HANDLING OF STOPPER HEADS

By D. A. Johnson.

IMMEDIATELY upon receipt of stopper heads from the manufacturer there should be a sufficient quantity of them unpacked to last for several weeks, and they should be placed around or on top of the open-hearth furnaces, where they will have a toasting heat until ready to be used. As fast as the supply is drawn from, it should be replaced by others from the storehouse. This insures a gradual elimination of the moisture that may have been collected in transit.

The stopper rod man should have his work bench in close proximity to the open-hearth furnace, where the stoppers are drying. After seeing that the rod and bolt head are clear from slag, the first operation is to place the correct number of sleeve sections on the rod, shoving them clear up to the goose neck. The bolt is then inserted in the stopper head and clinched on to the bottom of the rod.

The bolt head should be smeared with gannister or luting of some sort before placing it in the stopper head. A suitable moist stopper mixture, prepared from graphite specially for this purpose, can be used with advantage. The recess in the stopper head should then be filled with gannister also, completely covering the bolt head.

Next, the bottom section of the sleeve should be brought down on top of the stopper head with plenty of this mixture in between and the surplus which squeezes out can be used on the joint of the second section and so on until the top is reached. Usually the stopper rod is designed with a large cap of approximately the same outside dimensions as the sleeve itself, and this works up and down on the rod on a screw thread, covering a distance of three or four inches. Between this cap and the upper section of the sleeve place a coil wire spring surrounding the rod and sufficiently stiff to hold the sleeve section firmly in place, yet flexible enough to allow for expansion and contraction of the entire completed sleeve. The heat is hardly enough to draw the temper from this spring, but it should be watched. The tension should be light in the beginning, because when the hot metal surrounds the entire sleeve section it will expand from a quarter to a half-inch, and without such provision the strain will be almost sure to force the stopper head from the rod at the bottom or crack one of the sleeve sections.

It is the practice in many steel mills to pour a gannister mixture—which is thin enough to flow readily—in at the top end of the sleeve after it is completed, thus filling up all the space between the sleeve and the rod clear down to the stopper head. After the rod has been made up in this way, it should be taken to the drying room, which is a vault-like affair with a circular revolving hanger near the ceiling, built something on the order of a stamp rack, which holds the rubber stamps on your desk. The diameter of this is sufficient almost to fill the room.

The completed rods should be placed in this room upside down—that is, with the portion containing the stopper up near the roof and the goose neck near the floor. The reason for this is that whatever moisture is inside of the sleeve will settle to the bottom and even with long drying the stopper will not be in proper condition if the moisture keeps running down all the time.

As the wheel containing these rods is rotated, the ladle man removes the one which has been in the drying room the longest and the stopper man can hang another one its place. This drying room should have a fire built on the floor, and it should be going day and night. After the rod is taken from this drying room and placed in the ladle, care should be exercised to see that the stopper head seats properly in the nozzle, and it should be operated up and down once or twice to prove this. A little dry sand sprinkled around the stopper head where it fits into the nozzle, after it has been seated for the first heat, will stop any flow of metal, providing the fit is not perfect.

A fire of some kind should then be built in the ladle. Some use charcoal or wood fire, others have oil or gas-flame blow torches, which heat the stopper head and adjacent parts of the sleeve and nozzle, up to at least 250° F. before the metal is turned into the ladle.

If a stopper head cracks the cause can be looked for in either not allowing enough room for expansion lengthwise of the sleeve, or a bolt head which fits too tight in the stopper. If the stopper head "scalps"—that is, if a piece flies off the outside, this is caused by moisture or too quick heating and will not occur if the above directions are followed as to first heating. If the stopper head washes before the metal, it is usually on account of an improper fit and when the leak starts the wash of the metal gradually eats into the stopper head.

In one graphite stopper head manufactured the grain runs lengthwise instead of crosswise, and this gives it considerably more strength, and there is less liability of pulling off a piece in case the stopper sticks to a nozzle.

The moist stopper mixture is made of the same materials as the stopper head and an inch or two of water on top of the keg or barrel will keep it in perfect condition ready for instant use.

◆

NEW EXPORT APPLICATION FORM ISSUED

THE War Trade Board, Washington, has issued a new export application form X-2 covering the following articles: Abrasives, balata, copper cable, asbestos, billets, blooms, copper sulphate, shipboilers, tubes, brass articles, chromium, cobalt, copper ingots, copper scrap, copper wire, industrial diamonds, electrodes, emery, ferrosilicon, ferrotungsten, flax, gaskets, steel ingots, pig iron, iron plates, iron scrap, manganese, manila rope, molybdenum, linseed oil, castor oil, pipes, potash, rubber, sheet bars, copper sheets, steel plates, steel slabs, tank plates, wire rope.

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TRADE BALANCE COMPELS EMBARGO

THE decision of the Canadian Government to correct the adverse trade balance by means of an embargo on selected imports should be welcomed by the majority of industrial circles as being both necessary because of present conditions and desirable in its probable effects on future trade expansion.

The list embraces a wide range of articles which affect the general public more or less directly and include many items which are now manufactured in Canada, but are subject to competition from imported articles made under more favorable conditions as regards quantity production and supplies of material. Intensive advertising and, in many cases, advantageous patent control have frequently militated further against home manufacturers.

Three immediate results should arise from the pending action. A substantial reduction in the trade balance should be rapidly effected: home production will be increased to a degree where economies arising from increased output may be effected: holders of Canadian patents who have limited their production here to a minimum while importing largely will be unable to do so longer and additional branches of industry are probable in this respect alone.

While many of the articles which it is proposed to prohibit are more or less in the nature of luxuries, the return of normal international trading conditions will find many of these in the lists of competitive exports and full advantage should be taken by every manufacturer whose production will be stimulated for some time to come.

Automobile manufacture has had a considerable footing here for some years although imported parts and chassis formed the bulk of the business. Tire factories are well established,—silverware, musical instruments, footwear and clothing have all been made here of high enough quality to suit the most fastidious and permanent enlargement of these activities alone will be of considerable benefit to many centres of industry long after the present financial conditions primarily responsible have been overcome.

The working out of the details by the Canadian War Board in consultation with those interests directly affected will be awaited with interest and confidence. The personnel of the board is ample guarantee that developments will be for the greatest good of the greatest number.

Similar action by the States is expected and its reactive influence on other lines here is the subject of much interested anticipation.

INDUSTRIAL CO-OPERATION.

PROBABLY never in the history of the world has the great need for co-operation between capital and labor been so pronounced as that of the period of revolutionary developments through which we are now passing. Few cannot but be impressed with the absolute necessity of "carrying on" to the very limit of our capacities. The present is no time for dissension and strife, with the natural consequence of decrease in production. The strain upon the country's resources, in the constant drain of men and material, has made it imperative for all to put their shoulder to the wheel, so as to maintain a steady, though oftentimes seemingly slow, progress to that end we have in view, namely, the successful prosecution of the war. Sitting still and telling others how they should proceed is not a man's work under existing conditions. What is required is that everyone should get out and push, thus lessening the load and making it easier for those who have, so far, assumed the greater portion of the burden.

The belief is becoming prevalent that the day of labor is approaching when the workingman's voice will be heard in the different councils of the world. Revolutionary changes have undoubtedly taken place during the past three years that will hasten the realization of their ideals—or rather ideas, as it is very improbable that the former will be achieved by the present, though waning, methods of agitation and strikes. However, even with the possibility and hope that a better day may dawn for the masses of the people, as a result of this devastating war, the present is surely no opportune time to throttle the valve of industry and agriculture and choke the flow of productive energy that is so essential to maximum attainment in every line of the country's activity.

While many of us may feel the apparent injustice of certain conditions, we should nevertheless realize that the sacrifice we at home are asked to share is almost infinitesimal when compared with what the soldier at the front is forced to endure, and that invariably without complaint or murmur.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

THE CORROSION OF IRON AND STEEL AND ITS PREVENTION.—III.

By Abe Winters

AS HAS been shown, the rusting of iron and steel is a definite chemical process due to the combined action of air, moisture, and carbon dioxide upon the metal. The increased rate of chemical corrosive action due to a local increase of temperature is noticeable, and may be due to galvanic action set up between portions of the same metal at different temperatures.

Corrosion, or the oxidation of substances by chemical action is always accompanied by electrical energy, which may be of more or less intensity, or electromotive force according to the substance consumed. Rust proceeds solely from the action of acidulated moisture upon a clean iron surface, and is probably only a point action in the beginning.

The affinity of the iron for the oxygen in the acidulated moisture of the air or water in the oil, or from other sources is greater than its bond with the hydrogen, which is sixteen times the volume of oxygen united with the iron to form hydrated $Fe_2 O_3$ or red rust. They hydrogen, from its light specific gravity, in its effort to escape into the air pushes up the overlying coating, increases the area of the affected part, cracks the coating in its exit, moisture enters again, and corrosion is master of that location.

The rust which has thus been formed is hygroscopic and carries twenty-four per cent. of moisture as it forms. This moisture never dries out under any atmospheric heat condition, but is ever ready for a chemical decomposition. The hydrated red rust, being nearly two times the volume of the iron from which it is formed, adds its efforts to the free hydrogen to push through any protective surface film and eventually create havoc over the entire surface. This mechanical action is far more energetic than a mere casual observation would lead one to imagine. In considering the question of rust prevention or prevention of corrosion, it is essential that the nature of the corrosion and the cause of its formation be known.

Protection

The general subject of protection against rust or the corrosion of iron and steel may now be considered by reference to the four principal methods which may be employed, each method having its respective value and limitations. All have proven practical for particular purposes, although none of them are perfect under all conditions; a very wide field is still open for more extended use of these preventatives.

Group No. 1.—Alloying, or introduction of other metals into the composition of the steel when manufactured.

Group No. 2.—Covering the steel by mechanical means, as by painting, enameling, lacquering or the application of inert metals.

Group No. 3.—Rendering the steel or iron surface passive.

Group No. 4.—Coating with metals electro-positive to iron.

We have already noted that changing the composition of iron influences the resistance to corrosion, wrought iron and steel of various methods of manufacture are greatly influenced in corrodibility by the amount of phosphorus contained in them. With one per cent. of phosphorus present the corrosion is a little over one-half as great as in cases where the iron is free from phosphorus.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers 1917-1918

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Vice-President—James Vallier, 701 Crawford Street, Toronto.
Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ont.
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PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

If two pieces of steel containing different percentages of phosphorus are immersed in salt water, in contact, the low phosphorus specimen will corrode more rapidly than the high grade metal. Iron alloyed with nickel, cobalt or chromium behaves in a similar manner.

Many different kinds of steel are now being made in which other metals are being added, such as tungsten, copper, vanadium, zirconium, molybdenum, etc. These additional metals not only affect the physical qualities of the steel, but also influence the rate of corrosion to a large extent. It is probable that future development of this method of combating the corrosion difficulty may eventually throw light upon the mysterious iron preservation methods used by the ancients upon various specimens which have been the source of admiration and wonderment on the part of thousands of our leading scientists during recent years.

Group No. 2

The most common and widely known method of protecting iron or steel from corrosion is by covering the iron or steel surface so as to mechanically protect it. A pigment and a liquid mixed together so as to form a thin coating when spread or sprayed is the method usually employed under this group and requires only brief attention in this article. The essentials of good paint are adherency, non-corrosive properties, hardness and elasticity, proper drying properties, durability and covering power.

Paint destruction may result from the following causes: Mechanical injury, action of gases, chemical action between the pigment and the liquid vehicle, chemical action between the surface covered and the paint, action of light, peeling, cleaning, and from water.

To successfully design a paint which will resist all of the previously named destructive agencies is a difficult matter. The field is an enormous one to cover and but little positive knowledge has yet been obtained, though the investigators and experiments have been legion, and the literature on the subject embraces volumes. Experiments are numerous in the field of designing a waterproof coating to be applied over the pigment which has been found to possess the most preservative qualities, independent of the water-repellant features, but the goal has never been reached.

How effectively a thin coating of the proper material can protect the surface of a paint which it covers can be seen in the lettering of old sign-boards, which is perhaps an example of the most durable paint of which we have any record. This protective effect is explained by the well known fact that lamp black is one of the best water-repellants known, that it is practically indestructible by oxidation or acids, and being per se of an oily or greasy nature, when mixed with a pure oil and being in a measure elastic, it has effectually preserved the surfaces and not allowed the water to reach the underlying coats of white lead.

The electro-deposition of inert metals upon iron or steel surfaces as a means of protection from corrosion, as well as coatings obtained by immersing the iron or steel in bath of the molten metal, may or may not be even temporarily effective, the resistance to corrosion depending entirely upon the continuity and mechanical strength of the coating; vitrous enamel is employed effectively as a covering for cast iron water manifolds and is regarded by certain authorities as being superior to any other known process of rust-proofing.

Group No. 3

Iron under certain special conditions assumes a state in which some of the properties it usually possesses are not apparent. Certain strong oxidizing agents will prevent the solution of iron by an electrolyte.

When bright clean steel is immersed in concentrated fuming nitric acid, it becomes passive and is no longer soluble in dilute acid nor is it able to replace copper from a copper sulphate solution. Authorities differ greatly as to the cause but the condition thus produced is the foundation of one of the present widely exploited methods of rust-proofing iron or steel.

The Bower-Barff process is an example of the passivity group. The process consists of producing a rustless coating upon cast iron, steel, etc., by exposure to a low red heat in special furnaces or retorts and subjecting the surfaces thus exposed to the action of superheated steam, carbonic oxide gas, hydro-carbon and hydrogen gas alternately or in combination according to the different processes.

Other processes by which iron is given a rust-resisting coating are those known as Coslettizing, Parkerizing, etc. These processes depend largely upon the action produced when the iron or steel is immersed in a hot phosphorized solution containing either manganese dioxide or zinc oxide.

Questions and Answers

Question.—We are experiencing considerable trouble in our nickel-plating department owing to excessive "pitting" of the work. After having done everything our knowledge could suggest, we, as old subscribers to your publication, beg to request your opinion as to cause and cure of the condition as herein described.

The product being plated is grey iron stove plate. Present process includes electro-cleaning, swabbing, acid dip, scouring and final rinse, then nickeled direct on iron.

One solution yielding pitted deposits is approximately 500 gallons made up from 300 gallons of old double salt solution of 6 degree Be, by additions of nickel sulphate, boric acid, magnesium chloride and nickel carbonate. Solution slightly acid, 12 degree Beaume, and operated at a temperature of 110 degrees Fahr. with one-half the anodes of 98/99 per cent. cast nickel, and one-half rolled anodes, duration of plating is from 45 minutes to one hour. Deposit heavy

Another solution yielding pitted deposits was made from an 8 degree Beaume double salt solution by addition of some chemicals as mentioned in first bath, excepting that ammonia was used instead of nickel carbonate. Acidity, very slight, 12 degree Beaume, nearly all anodes are pure cast nickel. Temperature of solution during operation, 110 degrees Fahr. Duration of plating, one hour more. Deposit heavy.

We have cleaned everything connected with the baths, boiled and filtered the solutions, added single salts, boric acid, magnesium chloride and carbonate of nickel. The labor is the only thing that gave a temporary relief, but after a day or two the same trouble reappears. We have added about 60 pounds of nickel carbonate to the 500-gallon tank and same proportion to smaller one. Ammonia has bad effect.

We have worked the current from 1.25 volts to 2.5 volts and from 50 amperes to 150 amperes for the big tank and from 35 amperes to 100 amperes for the small ones, without any appreciable difference in the fitting difficulty. What shall we do to correct the condition?

Answer.—Pitting of nickel deposits has annoyed hundreds of good platers and is one of the conditions met with in nickel plating which requires careful consideration when encountered. The two principal causes of pitting are: excessive current density (amperes per unit of cathode surface) and low metal content in combination with excess acid. In your case we believe the latter condition is the source of your trouble. The actual metal content is evidently much less than you imagine. The temporary relief obtained by additions of nickel carbonate indicates a condition which should not occur in a well balanced nickel bath operated as you describe.

We are inclined to believe you have added the various chemicals without due regard to their respective value in the solution and then depended upon the Beaume hydrometer to indicate the metal density. We would impress upon you the uselessness and misleading character of the Beaume hydrometer reading in cases of this kind. As long as a nickel solution consists of nickel salts only and the acidity is kept accurately constant, the Beaume hydrometer serves as a useful guide. In commercial practice the foregoing condition is never met.

The formation of excess acid in the solution or the addition of chemicals alters the accuracy of the hydrometer reading and renders it absolutely useless as a guide toward the maintenance of proper metal content. The only reliable method is analysis. Your solution of 12 degrees Beaume has been constructed by the solution of at least five different chemicals, three of which have in no way added to the metallic strength of the bath, but have helped to boost the Beaume reading and mislead you as to the actual strength of the solution. In fact the conductivity of the solution is really too great for the amount of metal it contains. Excess hydrogen is liberated and pitting results. Furthermore, if the nickel solutions were well balanced and the effective anode surface had been adequate before additions of nickel carbonate were begun, we do not think the solution should be even slightly acid at present with the nickel carbonate in solution and the bath properly operated.

Furthermore, if your anode surface is approximately 50 per cent. rolled nickel and the current strength is actually as low as you mention, the current does not play a very important part in the case. But, if the anode surface consists of too large a percentage of rolled nickel the disintegration of the anode may not take place with sufficient readiness to feed the bath and the solution becomes acid and depleted in metal. This would account for the temporary effect of the additions of nickel carbonate.

We fail to see why you use rolled nickel anodes if you have no difficulty in obtaining good cast anodes of 98/99 per cent. nickel. As you have not mentioned the relative quantities of the various chemicals used in these baths, we can not judge of their respective bearing on the question at issue. However, if your nickel solutions do not contain at least 2 or 3 ounces of boric acid per gallon we would suggest additions to total this amount. Our experience has proven that nickel solutions operated either hot or cold may be very strongly acid to litmus if the metal content is maintained at not less than 2.6 per cent. With this metallic strength and from 2 to 3 ounces boric acid per gallon present, the allowable current density would greatly exceed the figure given in your letter and the output per tank would be increased with no difficulty from either pitting or burning.

Therefore, ascertain the actual metal content of the solutions by analysis for metal. Retard the evolution of hydrogen by use of boric acid, eliminate excess rolled anodes, maintain effective anode surface equal to or exceeding normal cathode surface, discard hydrometer as guide to metal content. Do not force the deposits. Maintain the solution by additions of single nickel salt only. Ascertain whether anodes are actually feeding the solution, if not add more corroding salts.

Question.—Would the addition of cobalt sulphate to our regular nickel bath enable us to produce a harder, firmer deposit at higher current densities than is possible with the pure nickel solution. Our product is a small brass article and our daily output averages ten thousand pieces; we now run them 30 minutes in the nickel bath.

Answer.—The introduction of cobalt sulphate into the nickel solution would increase the metallic strength of the solution in the same manner that nickel sulphate does. The effect of the cobalt as a hardener would be only temporary unless cobalt anodes were used in proportion to percentage of cobalt sulphate in the solution; this fact we believe will be clear to you upon further consideration. The permissible current densities would be higher only so long as the cobalt content of the solution was maintained constant. The prices of cobalt salts and cobalt metal at present practically prohibit the use of cobalt in any form for electro-plating

Additions of cobalt salts to the nickel bath would have a tendency to darken the color of the deposit and increase the tarnishing qualities to a very marked extent, even though only a small amount were used.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	28 00
Copper, electrolytic	28 50
Copper, casting	28 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	22 50
Copper, heavy	22 50	22 50
Copper wire	22 50	22 50
No. 1 machine composition	22 00	21 50
New brass cuttings	16 00	14 00
No. 1 brass turnings	15 00	15 75
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	20 50
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	31 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	20 00	13 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	7 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.
B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 47
Solder, guaranteed	0 50
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A....list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	8 95
Premier, 10¾ oz.	13 85	9 25
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to $0.54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Arsenic, white	.12
Caustic soda	.07
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate ......(per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.41
Sodium cyanide, 98-100%	.38
Sodium hydrate	.04
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.55
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 6- 9
Tripoli composition	06 to 9-10
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55
Crocus composition	08 to 8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 38
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J, Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

The General Market Conditions and Tendencies

TORONTO, April 1.—April 1 brought few jokers to the iron and steel trade. The announcement, made officially a day or so ago that the present prices, as approved by United States would remain until July 1, made it certain that Canada would see little departure from the present era of high prices. In spite of this, though, dealers in many cases seem certain that the tendency is for lower prices in Canada. It is contended that the spread is too great on certain lines between United States and Canada, and that, if Canadian firms are to successfully compete with the products of American mills, which they meet in competition all the time, they must have the advantage of cheaper raw material. Any attempt to reach such a condition suddenly would mean the wrecking of many of the Canadian dealers who are stocked up now with material bought before the United States set prices on the lower grade.

Toronto dealers cannot see where the $1 reduction on basic pig iron is going to have any reflected influence on the

Canadian market. It is entirely different to a sweeping change, in which case the Canadian market would be very responsive to any tendency either up or down displayed across the border. The general view is that the dollar cut was made in the interests of the smaller roller. It served a dual purpose. It answered the demand for an increase in the price of steel plates, etc., by lowering slightly the cost of basic iron and scrap, the main raw materials used in these establishments.

Old material dealers are not affected by the slight change in the American price. Business is not brisk. There is apparently no immediate prospect of a lowering of the restrictions against the exporting of scrap metals from Canada, and the buyers are not keen to load up their yards with nothing in sight to see to outside of the Canadian markets.

Machine tools and supplies are in good demand. Oil pumps sell practically on arrival from the factory, and there is practically no surplus stock on hand.

Iron and Steel

"The tendency of prices for steel plates, sections, etc., is going to be lower. It may not come to the surface at once, but the indications are plain enough." That is the opinion of one of the best informed men on market conditions. "The setting ahead of the time for a revision of U. S. prices until the first of July will have a tendency to keep the market steady in the meantime. We were not anticipating any radical changes, and conditions are now practically where they were prior to the 31st of March." This dealer showed a quotation of prices for the same lines of material for Canadian and U. S. factories. The Canadian prices were in many cases practically double those of U. S. "Here's one case I know of for a fact," continued CANADIAN MACHINERY'S informant. "A Brantford firm tendered on a boiler contract against the Toronto branch of a United States firm for quite a large order. There was such a difference in prices of raw material that the United States firm was able to come in against a duty of 33 1-3 per cent. and secure the business, beating the Canadian maker by quite a comfortable margin. It is that condition that is going to be a powerful factor in a movement toward a lower level of prices for the Dominion."

Machine Tools

Canadian dealers are finding it hard at present to get orders for the larger sized chucks filled in United States. Many of the larger machines made there are required for munitions plants, and the authorities are none too anxious to have them leave the country. Permits and licenses seem to stand in the way of the larger sizes, say from 12 inches up, and on that account deliveries for these are none too good or certain. Orders are steady and prices remain as quoted, there being no list changes of any notice.

Scrap Metals

The market for scrap materials is just where it has been for the last two weeks. It is not brisk. Dealers are none too keen to buy largely. The dollar off the American pig iron and scrap price makes little or no difference to the Canadian prices. In fact the government control of large amounts of cuttings from munitions plants, etc., has made the market such that there are no surprises, nor are there likely to be any in store. There is a very wide margin at present between pig iron and scrap metal—in fact the difference is too great. The present figures show that there is a difference now between pig and scrap of $8, while in ordinary times a spread of two dollars would be considered a fair average. Sales at a shade off the list prices are being made in some cases, the dealers claiming that the narrowed scope in which they have to sell makes it necessary for them to protect themselves to this extent.

High Speed Steel

"Shipping is the big problem now," stated a Toronto dealer to CANADIAN MACHINERY. This man deals principally in high speed steel. "It is not such a serious matter to get orders through now as it was a year ago. At that time I know for a certainty that certain good Canadian business had to be shelved for a time in order to allow Russian war orders to be filled Of course that has been done away with, and it is not such a serious matter to get orders through the mills as it is to get the shipping accommodation to forward them. The war situation has much to do with business also. It looks to me as though it would be good policy for Canadian buyers even at present prices to buy for import now. Of course that seems a strange policy when one considers the present very high prices of carbon steel."

Another feature that may be overlooked in this is that Canadians have been buying very peculiar shapes and sizes. These are hard to get, and they are going to be harder to get later on. Munitions shops want equipment to fit many different machines. The stock on hand of high speed steel is being depleted much more rapidly than it is being renewed. This, according to our information, is true of Montreal and Toronto in particular.

There is nothing of special interest in this week's happenings on the nonferrous metal markets. The Canadian situation seems to be gradually working into a smaller circle, due to the excess of use over the available new supplies. Prices remain steady with business demands brisk.

Foundry Supplies

The setting of the United States price on pig iron down to the extent of one dollar per ton is making little or no difference to the Canadian situation. The most satisfactory point is that there is apt to be quite an improvement in the production of pig iron in the very near future. This will relieve the minds of a good many men who are wondering just now where their supply is coming from. There appears to be a good supply of scrap in the country. The precedence of war orders over other lines is causing business to be kept brisk in the former lines, although it cannot be said it is dull in other lines. It is far from it.

MARKET FOR ASBESTOS MANUFACTURES IN ENGLAND

J. E. RAY, Canadian Trade Commissioner at Birmingham, England, has the following to say in regard to the market for asbestos products in that district: At the present time there is a brisk demand for manufactures of asbestos in the Birmingham district, but according to replies to specifications recently cabled by this office to Canada, the obstacle to the transaction of business is dearth of shipping space. However, if it is impossible to ship under the circumstances, efforts should be made to ascertain the requirements of the British market in preparation for after-war trade. As is well known, the production of raw asbestos in Canada has increased rapidly during recent years, but manufactures of the same have made but tardy progress. Some twelve months ago a range of German samples of manufactured asbestos was forwarded to the Department of Trade and Commerce. An excellent trade in these commodities was transacted by Germany with the United Kingdom prior to 1914. Firms interested can be introduced to importers in Birmingham, with whom preliminaries might be discussed in preparation for future trade.

FIRMS WITH FOREIGN TRADE SEEK VETERANS

THE rehabilitation of many returned soldiers in the Canadian forces has started with a struggle with the English language. The vocational training department of the Military Hospitals Commission, to whom the Government has entrusted the business of making verterans fit again for civil life, has scores of men enrolled in English classes in the military convalescent hospitals.

French, Swedes, Italians, and Norwegians who enlisted in the army of their adopted country when the war broke out are returning unfit for further military service, and the Government is giving them every opportunity to become equipped for success in the future.

English the First Necessity

It is commonly known that many foreigners who migrate to Canada are condemned to common labor by their lack of a knowledge of the language. Abilities which would enable them to become very useful factors in business are lost to them because of their handicap, and they are eager to embrace the opportunity which is being afforded them during their days of convalescence.

In the west where foreigners are to be found in large numbers, men who have learned English will find places in the business world easily. The appreciation of the work which the commission is doing in this line was evidenced recently in Saskatoon when a very perturbed manager of a big firm phoned to the hospital to see if they had a man who could translate some Norwegian mail for him.

The school was ready with the man.

Headquarters for

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Used with unequalled success for general machinery castings. You'll get perfectly clean castings by using it. Put it to the test.

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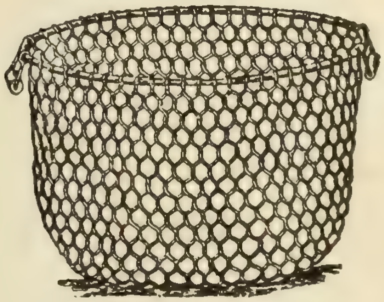

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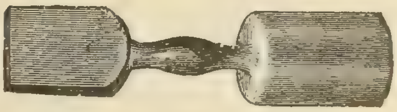

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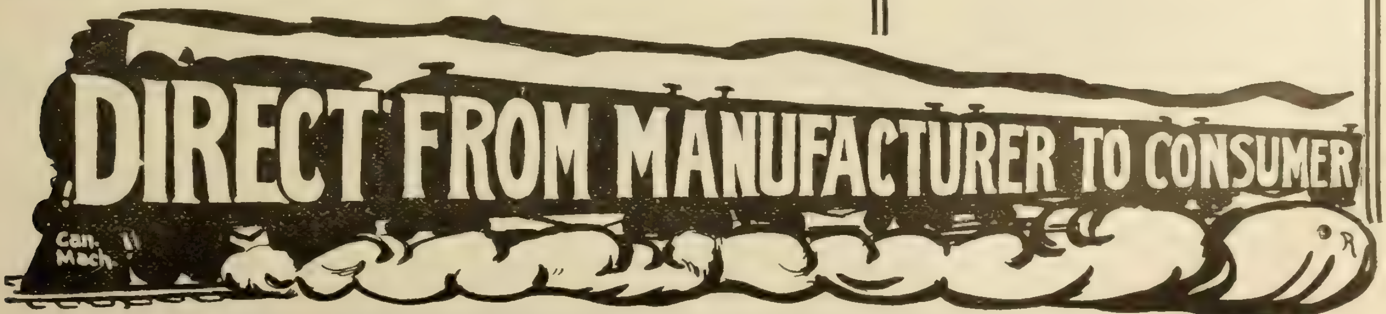
DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

TRADE GOSSIP

The Canadian Car & Foundry, Co., Montreal, has bought out the interests of the Standard Steel Co. in Montreal. The plant of the latter has been in operation on munitions steel for the past two years, and under the new management will continue on this class of work for the Imperial Munitions Board.

Order for Canadian Locomotive Co.—The Canadian Locomotive Co., Kingston, has received a contract for 70 locomotives from the Dominion Government for the government railways. The approximate cost of each locomotive is $60,000, which makes the contract worth about $4,200,000.

Montreal Locomotive Gets Large Order.—The Montreal Locomotive Works, the Canadian branch of the American Locomotive Co., has received an order for 80 locomotives from the Canadian Government Railways. The locomotives will have an approximate value of $60,000, so that the total order will aggregate some $4 800,000.

Big Steel Plant at Sydney, N.S.—The Dominion Government has made arrangements with the Dominion Steel Corporation for the installation of a plate mill at Sydney, N.S. The mill will cost between $3.000,000 and $5,000.000, and will be capable of producing 150,000 tons of ship plates annually. It is hoped to have the mill in operation by the autumn of 1919.

Cast Iron Pipe Wanted.—A London, England, dealer in iron and steel products and cast iron pipes of all kinds asks to be put into touch immediately with Canadian manufacturers of cast iron rainwater and soil pipes. For specifications and illustrations see pages 484-485 of March 25 issue of the "Weekly Bulletin," published by the Department of Trade and Commerce, Ottawa.

Greater Production in B.C. Coal Mines.—An increase of ten per cent. in the output of coal in British Columba was shown in January, according to returns made by the various operating companies to the Department of Mines. The total tonnage (long tons) in January, was 230,755. compared with 197,636 in January, 1917. The production, according to districts, was as follows:

Price For Aluminum Fixed by President.—A maximum base price of 32c a pound for aluminum at the various American plants and their subsidiaries has been fixed by President Wilson. The price is subject to revision on June 1, and covers lots of 50 tons and over of ingots of a 98 to 99 per cent. grade. The price was fixed after investigation by the Federal Trade Commission, and an agreement by the War Industries Board with the producers.

Canadian Steel Plants Expect Large Contracts.—That all steel plants in Canada will probably be operating at full capacity throughout the year under heavy demand, and that large new munitions contracts are expected from the United States and Great Britain, are opinions expressed by Colonel Thomas Cantley, chairman of the board of directors, Nova Scotia Steel & Coal Co.

Montreal, Quebec. — The Canadian China Clay Co., St. Remi d'Amherst, has just shipped the first carload of fire brick to the Canadian Steel Foundries at Welland, Ont. A plant for producing silica sand for cast steel molding and furnace sands, organized by Prof. Bell of McGill University, has been started in the same vicinity.

Large U.S. Contracts Placed in Canada.—Orders for munitions, marine engines and other supplies for war purposes to an estimated value of fifty million dollars have been placed by the United States in Canada during the past five months. Of the total orders to the amount of thirty-five millions have been placed by the Imperial Munitions Board. The latter mentioned orders include contracts for seven million shells, two million cartridge cases and ten million forgings.

Scrap Iron Export Prohibited.—Export of scrap iron has been prohibited entirely by the Dominion Government with a view to conserving in Canada the limited supplies of iron and steel raw material easily convertible for manufacturing purposes. The United States prohibited export of scrap iron some time ago, and in view of the prevailing scarcity of supplies for the iron and steel trades in Canada it was found necessary to stop in Canada issuing further licenses permitting export of scrap iron to the States.

Practically all raw materials necessary to Canadian manufacture in essential industries re now on the prohibited list of exports, except on procuring of special license therefor from the War Trade Board.

Paul T. Irvin, who has been associated with the Wells Bros. Co., and the Greenfield Tap and Die Corporation for twelve years, has resigned his position as sales manager of the gauge division to accept the position of general sales manager of Lincoln Twist Drill Company of Taunton, Mass. Edward Blake, Jr. (formerly of Wells Bros. Co), is vice-president and general manager of this company, and Frank O. Wells, president, and Frederick H. Payne, vice-president of the Greenfield Tap and Die Corporation are directors.

Harold B. Chillas, Toronto manager of the Standard Machinery and Supply Co., and the son of George Chillas, of Montreal, died at Toronto on March 11, after a brief illness. Mr. Chillas was apparently in good health a few days ago when he was in Montreal on business. He was thirty-nine years of age, and is survived by a widow and two children. His brothers are Ralph Chillas, who is overseas with the Canadian forces, and A. Shirley Chillas, of the staff of O'Brien & Williams, of the Montreal Stock Exchange.

Export of Rods, Sheets, Plates and Bars Prohibited.—An order-in-council has been issued from Ottawa prohibiting the exportation from Canada of the following goods except under license issued by the Minister of Customs, at the request of the War Trade Board:—Abrasives and all materials entering into their manufacture, ammonium sulphate, calcium carbide, electrodes, machinery, chemical wood pulp, mechanical wood pulp, newsprint paper; iron or steel, comprising wire rods, wire, plain or galvanized, or otherwise coated; sheets, plates, bars.

Aluminum Price Fixed by War Industries Board.—A price of 32 cents per pound has been fixed on aluminum by the War Industries Board acting with President Wilson. The figure applies to all lots of 50 tons and over of ingot of a grade of 98 to 99 per cent., the existing trade differentials for other grades being continued. The new price holds for all business done up to June 1 next, when provision is made for revision if necessary. In announcing the price several provisions were made for dealers, one being that the same price must be maintained to all, whether Government Allies or public.

Steel Companies' Loss Through Fuel Shortage.—It is estimated that the steel companies in the United States have lost between $100,000,000 and $150,000,000 because of the compulsory cutting down of production in January, due to lack of fuel and to freight congestion. Additional losses have been sustained through the production of off-quality of steel arising from the use of high sulphur coal and poor coke. Because of these developments the productive costs of steel have advanced enormously and some of the smaller companies are actively agitating the question of more remunerative prices from the Government.

New Statistics Bureau at Ottawa.—Hon. C. J. Doherty has given notice of a resolution providing for the creation by the Minister of Trade and Commerce of a Dominion Bureau of Statistics to be called the Dominion Bureau of Statistics, to collect and compile all statistical information relative to the commercial, social, economic and general activities and conditions of the people of Canada. Provision is also made for the appointment of an officer to be called the Dominion Statistician to have control over the new bureau, which will collaborate with all Government departments in the compilation and publication of statistical records of administration and at intervals take the census of Canada.

World's Aluminum Output.—The world production of aluminum has increased 20 fold since 1900, while that of tin has scarcely doubled meantime. Aluminum production in 1900 was 7,200 tons and in 1916 135,000; tin production in 1900 77,-200 tons, and in 1916 117,500. Of the output of aluminum in 1916 approximately 62,000 was the product of the United States, 20,000 produced in France, 16,000 in Norway, and 8,000 in Canada. Figures differ radically as to Great Britain, ranging from 4,000 to 12,000 tons production. In Switzerland the normal product is about 20,000 tons, but has been materially reduced by inability to obtain from France the bauxite from which aluminum is produced

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Nova Scotia Steel Fills Vacancy on Board.—At the annual meeting of shareholders of the Nova Scotia Steel & Coal Co. at New Glasgow, N.S., the number of the board was increased to sixteen, and there was one vacancy to fill, through the death of Hon. Jas. D. MacGregor, vice-president and charter member of the directorate. That vacancy was filled by the appointment of Hon. Robert M. MacGregor, only son of the deceased, while the two newly-created positions were filled by the appointment of D. C. Jackling, New York, and W. Hinkley Smith, Philadelphia. All the old members were re-elected with the exception of A. S. Rendall, of St. John's, Nfld.

Algoma Steel Corporation Developments.—The Algoma Steel Corporation has just installed its fourth blast furnace with a capacity of 500 tons of pig iron per day, according to information obtained from an official of the company. The company's output of steel ingots per month ranges from 43,000 to 45,000 tons, and when the coke ovens, which are at present under construction and are expected to be completed some time in June, are in commission the monthly output is expected to rise to 50,000 tons. Business is confined solely to shell steel, and orders on the books are sufficient to keep the company busy for a long time to come.

Copper Refineries May Have to Close.—A crisis appears to have been reached in the copper industry, and the opinion is general that the United States Government will have to raise the price of the metal, which has been pegged at 23½c for the past year. The copper refining companies have delivered an ultimatum to the copper producing companies stating that unless the latter pay an increased charge for the handling of their produce the refineries will have to shut down. Executive committees of the various refining companies have held sessions recently and the situation is so critical that it was deemed best to acquaint the producing companies with the real facts, accompanied with a demand that the refining charge be increased. It is expected that the copper mining companies will agree to the additional expense.

Steel and Iron Manufacturers Organize.—The metal interests held a separate meeting in the Windsor Hotel, Montreal, on Thursday, and decided to to organize a steel and iron section of the Canadian Mining Institute. An organizing committee was named which will start work at once. The members are as follows: Robert Hobson, Hamilton, Ont.; Col. Thos. Cantley, Mark Workman, W. C. Franz, Dr. Alfred Stansfield, W. J. Jannsen, H. M. Jacquays, J. A. Irwin, C. F. Bristol, Esmond Peck, G. H. Duggan and P. L. Miller, Montreal; J. J. Hartley, Kingston; F. H. MacDougall, Sydney, N.S.; F. H. Crockard, New Glasgow, N.S.; Geo. W. Watts and Wm. Inglis, Toronto; J. G. Morrow, F. A. Sherman and W. M. Curry, Hamilton, Ont.; Col. David Carnegie, Ottawa; Capt. David Kyle, Sault Ste. Marie; M. Deakin, Winnipeg; Fleet Robertson, Vancouver; Geo. McKenzie.

Bond Engineering Works Ltd., who recently took over the plant of the Queen City Foundry, announce that they are about to construct another addition on to their foundry located in the harbor industrial district at Toronto. In the new building will be a core room; cleaning and grinding room; and storage for foundry supplies; coke; moulding sand, etc. Facilities will also be provided for babbitting, painting, and assembling of the line of power transmission specialties which they will manufacture. Modern equipment of the best type will be installed, to facilitate the efficient handling of raw materials and the finished product. Special attention is being given to the welfare of the employees; in the way of light, heat and ventilation. An adequate system of dust collectors is one of the improvements contemplated. The locker room is to contain a locker for each employee; and shower baths; wash basins; drinking fountains; etc., will be provided.

U.S. Steel Corp. Unfilled Orders Decline.—The U.S. Steel Corporation reports that unfilled orders on hand Feb. 28, 1918, amounted to 9,288,453 tons, as compared with 9,477,853 tons on January 31, a decrease of 180,400 tons. Unfilled orders on hand Dec. 31, 1917, amounted to 9,381,718 tons; on November 30, 8,897,106 tons, and on February 28, 1917, 11,576,697 tons. The shrinkage of 189,400 tons in the unfilled orders of the United States Steel Corporation in February reflects the absence of buying on the part of domestic consumers. The Steel Corporation has a capacity for shipping over 55,000 tons of finished steel daily, but as a result of inadequate transportation facilities, shipments in February could not have averaged much more than 60 per cent. to 65 per cent. of capacity. In view of this, total incoming orders of United States Steel last month could not have been much more than 50 per cent. of capacity.

Prices Maintained on Steel Products.—Prices on ore, coke, steel, and steel products recommended previously by the Price Fixing Committee of the War Industries Board, Washington, subject to revision on April 1, were ordered by President Wilson to-day to be continued in effect until July 1. From April 1 to July 1, however, the maximum price of basic pig iron was ordered reduced from $33 to $32 per gross ton, and of scrap steel from $30 to $29 per gross ton. It is provided that new contracts calling for delivery of these products on or after July 1 are not to specify a price except with the understanding that it is subject to revision by any authorized Government agency. The announcement was made after approval by the President of a recommendation made to him by the Price Fixing Committee, and all manufacturers and producers are expected to observe the maximum prices.

Lyall Construction Co. Gets American Contract.—It is reported that the Lyall Construction Co. of Montreal is installing new machinery for the purpose of manufacturing a new size or type of shell. It is learned that the rumor is based on the arrangement being made by the company to turn out for the American Government the 4.7-inch shell, this being a new size, so far as Canadian plants are concerned. The machinery has now all been installed and the manufacture of the shells is beginning. This size takes the place in many respects of the 4.5-inch shell which the company was manufacturing for the British Government. It is understood that no great difficulty was experienced in securing the machinery in Canada. This American contract will take about six months to fill. The company is still working on 6-inch shells for the British Government, and the orders on hand are of sufficient magnitude to keep the plant operating for some months to come. The output of the factory is being well maintained and the statement is made that shipments are larger than ever.

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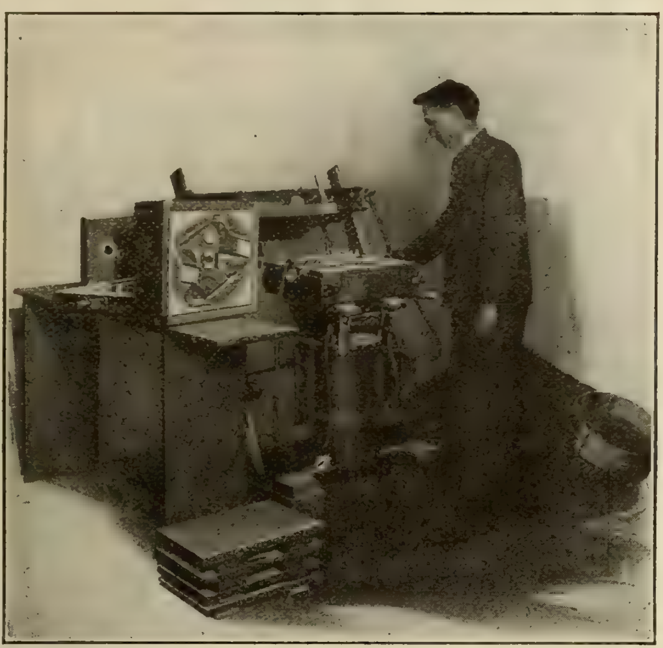
CANADA IRON FOUNDRIES

IN an address made before the "B" debenture stockholders of the Canada Iron Foundries in Montreal recently, F. Perry, a director, gave a survey of the company's position from the time of reorganization. He said in part:

"The liquidators of the old company had shut down the mines and the blast furnaces, leaving only the foundries in operation. The principal business of the foundries lay in the supply of wheels and cast-iron pipes at various points in Canada. That is to say, their principal customers were the railway companies and municipalities. In consequence of the war and the financial stringency which followed it, both railway companies and municipalities curtailed their expenditure very much. In fact, as far as the western muncipalities were concerned, business for a time almost ceased and has hardly begun to revive even now. If the new company had depended on these lines of business alone I am afraid it would have made a very poor showing. Fortunately it had also a number of side lines consisting in the supply of miscellaneous castings and the execution of job orders, and during the last two years it has been able to develop these to such an extent as largely to replace the falling off in other business. A good deal of this work has been indirectly war work, since it has consisted in the supplying of castings and so on to factories executing munition orders of various sorts. The company has not undertaken any munition making direct. Neither its plants nor its staff were specially adapted for it. It did put in a tender for the machining of shells, but the price which it felt able to quote was too high, and the order went elsewhere. But indirectly and in the manner I have stated, the company's business has been increased by the great new industry of munition making which has sprung up in Canada. Moreover, most of the work of this kind, being emergency work, has been carried out at good prices and shown very satisfactory profit."



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Fifty Subscriptions from One Firm

THE International Business Machines Company, of which Mr. Frank E. Mutton is vice-president and general manager, subscribed to 10 copies of THE FINANCIAL POST some months ago—these copies to go to their travelling salesmen. Now this company has increased the number of these subscriptions to 50 because the results of the experimental subscriptions have proved so satisfactory.

FRANK E. MUTTON

Mr. Mutton explained that the object of putting THE POST in the hands of the men of his company was to keep them intelligently acquainted with general business conditions in Canada. He said he knew no better paper than THE POST for the purpose. It would seem that his men have responded fully to effort made to keep them well informed about Canadian business affairs—so much so that the management have added 40 other men to the original 10 to receive THE POST.

When Mr. Mutton was with the National Cash Register Company as its Canadian manager, he was the king of all managers in the matter of sales records. In this position he achieved a big reputation built on solid achievements. He learned salesmanship in a school where competition was of the hottest kind, and where the competitors were brilliant men. Giving Mr. Mutton full credit for superior personal qualities and energy of the most ardent kind, it is taking nothing away from him when it is said that not a little of his success was due to his intimate and sympathetic knowledge of the other man's business. And he taught the men associated with him as salesmen to know the point of view and requirements of the men they called on to sell machines to.

As vice-president of the International Business Machines Company, Mr. Mutton is putting into operation an idea used by him in past days with brilliant results—he is causing his salesmen **to know the business and requirements of their prospective customers.** To establish points of contact swiftly and surely is one of the open secrets of successful selling.

In the case of **your** solicitations of customers and desired customers, it is excellent strategy to have your salesmen so well informed about business conditions generally, and about the interests of the men they canvass, that they will be able almost instantly to relate their proposals to the interests of the buyer. When a salesman shows himself intimate with the interests or business or objectives of the man whose order he wants, he is immensely strengthened as a salesman, and his percentage of successful canvasses goes steadily up.

Our definite suggestion to you is: Subscribe to THE POST yourself, and learn from its pages how your salesmen or executives can draw power from this newspaper. Then, having acquired the sought-for knowledge, subscribe to THE POST for each man in your service who can profit you by knowing what is in THE POST each week. If Frank Mutton is making a success of THE POST as a salesman's aid, it is reasonable to suppose that other managers of salesmen and executives can likewise employ THE POST as a producing agent. And so we ask you to sign and forward the coupon below.

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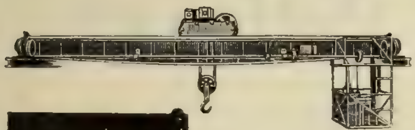

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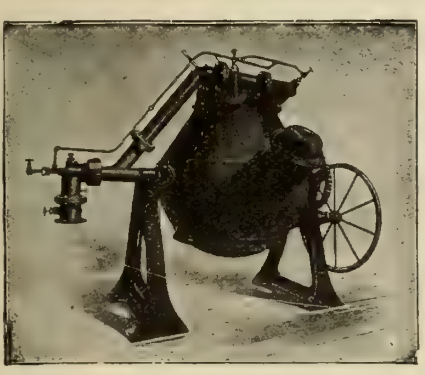

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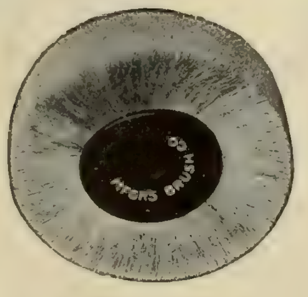

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Robert W. Service, in a strong War poem, "The Blood-Red Fourragere."

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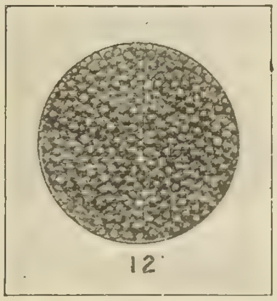

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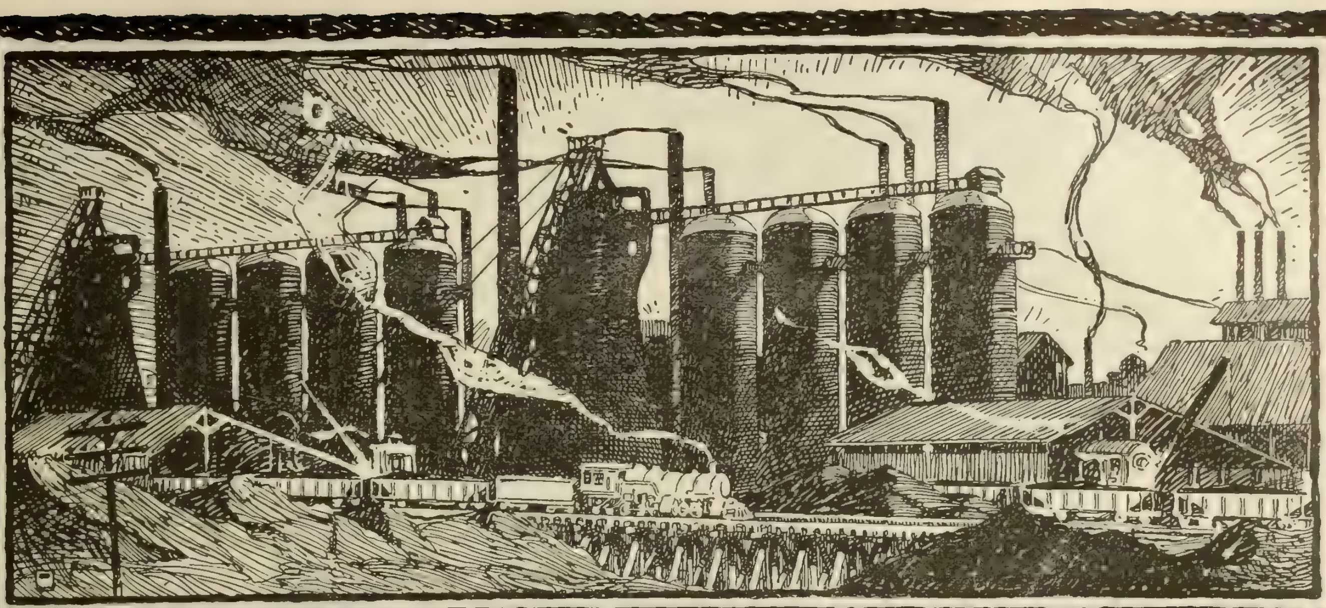

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Midland Machine Co., Detroit.
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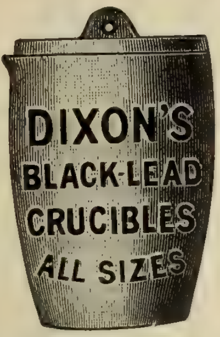

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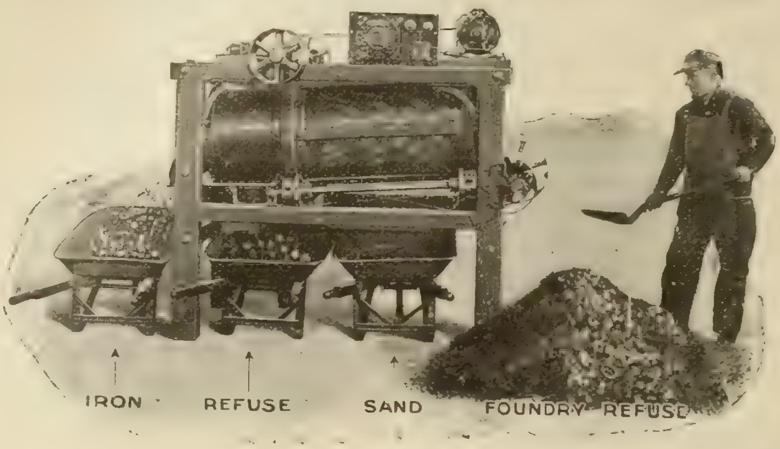
The magnetic method of recovering iron from foundry refuse is by all odds *the best*—users of the Dings machine pronounce it efficient, strong and durable. It takes everything a shovel handles as fast as a man can throw it in; and as for clogging, we guarantee it never will.



DINGS MAGNETIC SEPARATOR

can be set up by any foundry worker and operated at a cost insignificant compared with the value of the iron and sand it will reclaim. Considering the price you pay for iron to-day, it is now you need the "Dings."

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GRIMES ROLL OVER MOLDING MACHINES

The Most Convenient and Most Efficient Molding Machine on the Market.

Built on the principle that the **Centre of Gravity is the Centre of Rotation**—it is perfectly balanced and the largest flask can be easily and smoothly turned by one man.

Requires less than half the number of steps necessary with rockover machines, and consequently saves much time.

For continuous and economical work you cannot find a more efficient molding machine.

Write to-day for descriptive catalog.

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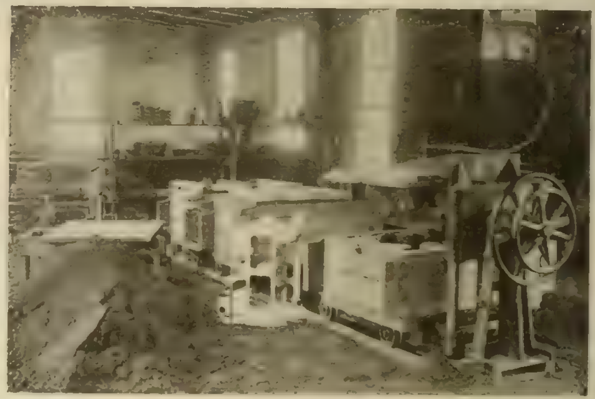

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"I am using twenty-six pounds of your KING KORE KOMPOUND, costing thirty cents, where I formerly used six and one-half gallons of core oil costing fifty cents per gallon, or a total of three dollars and twenty-five cents to do exactly the same amount of core binding, and get just as good cores."

"I can use foundry sweepings, blower dust and old sand with KING KORE KOMPOUND and produce a good, clean, porous core."

The above direct evidence—I have enough of the kind to fill a book — from practical foundrymen, illustrates the folly of using flour, linseed oil, molasses or other binders when this most economical of all core compounds is available. It uses up the slowest of any and can be used over and over again.

For medium and heavy grey iron, malleable iron, and aluminum castings, including dry sand and skin-dried molds.

The low price is another attraction. Send for a trial barrel on approval—shipped from my Windsor, Ontario, branch.

Stevens Core Gum Best for Small Cores

This is a dry core binder for all sorts of tiny and intricate cores.

It is the strongest core binder for small cores in existence. It will even bind dry coal ashes! A very small proportion is necessary—hence it is very economical to use. Best for brass

It is far cheaper than linseed oil or its substitutes. Send for a trial barrel on approval —shipped from my Windsor, Ontario, warehouse.

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Roylite will clean all metals in a more satisfactory manner more quickly than by the old method of using caustics, which frequently leaves the work showing streaks and discolorments.

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Roylite makes a splendid electro-cleaning compound, and we highly recommend it for this use as well as a still cleaner.

Roylite is manufactured by us in Canada, and we are therefore able to give you prompt service at a less cost than cleaners made in foreign countries.

We are prepared to demonstrate the use of Roylite either in our demonstrating plant in Toronto, or in your own plating plant if you so desire, and solicit your correspondence.

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TORONTO, CANADA

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, MAY, 1918 No. 5

PIONEER SHIPPERS
of
ALBANY MOULDING SAND

Labor and car shortage coupled with an unprecedented demand, will probably result in a severe shortage of moulding sand this summer.

If the foundries will arrange to receive this material in equal shipments during the next five months it will reduce the usual Fall rush and will work for the good of all.

Whitehead Brothers Co.

ESTABLISHED 1850

Largest Shippers in the World of Foundry Sands, Clays and Gravels

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Kawin Service has cut the cost of production in United States and Canadian Foundries from the Atlantic to the Pacific—has increased their output, promoted efficiency and in numerous ways put their business on a better organized, better paying basis. These things that we have done for others we can likewise do for you.

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Our new Laboratory at Buffalo is now in full swing. It is fully organized and equipped to take care of the business of our Canadian clients who find it convenient to deal with us at this point. Our Buffalo Laboratory will co-operate with our Toronto Laboratory in promoting the efficiency of their work.

KAWIN SERVICE IS GROWING.

Here are some of the things Kawin Service includes:—

Specification for the purchase of raw material and analysis of same.

Proper mixtures for your castings and analysis of your product at frequent intervals.

Reduction of losses to a minimum.

Instituting up-to-date methods of Cupola Practice.

Solving the practical problems that arise in the foundry.

The advice and co-operation of our Foundry Specialists.

We know foundry practice—every angle of it. We have studied it, investigated it and specialized in it. We should be able to assist you—we can assist you.

Get in touch with us without delay

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DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it—you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

THE E. J. WOODISON COMPANY, TORONTO

Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont.

The Publisher's Page

TORONTO MAY, 1918

Are You Through?

THERE'S a vast difference between being dissatisfied and being ambitious. There is, too, a similar difference between being satisfied and being unambitious.

A man, like you, might be satisfied with progress to date, but his success would only tend to whet his ambition: to create in him the desire to accomplish greater things than he had previously attempted.

Another man, however, finding himself earning fairly good money under the evil influence of the planet Mars, may become self-satisfied. The luxurious needs of extraordinary prosperity may choke his ambition. Wellenough's his name, but it might more appropriately be Poorboob.

The first type of man is preparing now, in the harvest time, for the winter which is sure to follow war-prosperity. His ambition will carry him forward and his sound judgment, his knowledge, his experience, will enable him to hold every trench as he carries it.

He is the kind of a man whom you can imagine as alert, clean shaven, hair trimmed, neat, even in overalls — frank, able to look straight in your eye instead of in your ear or your scarf pin—on time in the morning, on top all day and who knows the clock by sound and not by sight.

A man who in his quiet moments at home will find recreation in study of technical journals, who studies the other man's viewpoint and who recognizes in the advertising pages a wonderful opportunity to become familiar with the best of modern equipment and to learn to know the worth-knowing firms.

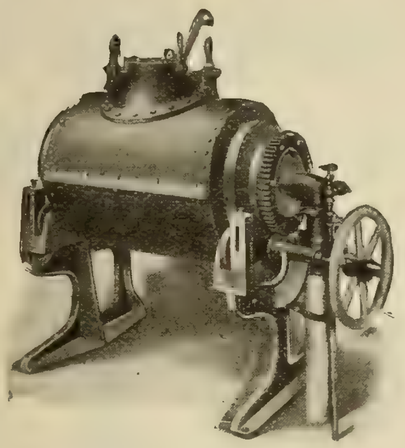
A man like that may be satisfied but he will never sit on his success, complacently saying, "I have done enough." When the period of readjustment comes he will not be one of those rated as unnecessary. He will have no regrets.

Fan that spark of ambition. Keep it alive. Make it fairly burn within you. Study, *Study, STUDY*. Lay in a stock of knowledge while there's time. You'll be able to sell it at a handsome profit later on.

Perhaps you won't have to wait to make use of it. First acquire the knowledge and something within you will show you the way to use it.

You can't use something you don't possess. Can you?

MONARCH HIGH EFFICIENCY FURNACES



Monarch Rockwell Single Chamber Furnace—"Simplex"—Oil or Gas

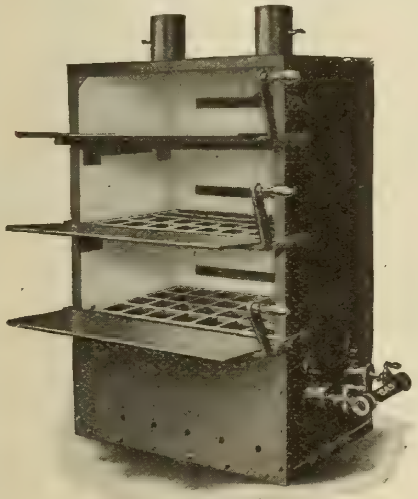
WITH your supply of fuel limited and the prices away up; with deliveries behind schedule, and labor scarce, you must conserve and you must operate efficiently.

You need Monarch High Efficiency Furnaces now, more than ever before. We have just the furnace you need.

The Double Chamber Furnace (below) melts, without crucibles, practically twice as much metal as any other furnace with the same fuel. The Single Chamber Furnace (at left) is built on the same lines as the Double Chamber Furnace, but without its continuous heating capacity.

These furnaces are for oil or gas, capacities from 300 to 6,000 pounds per heat—for ferrous or non-ferrous metals.

Monarch Core Ovens are hand made in any size up to 8 ft. square. They are sheet steel and are heavily lined with sheet asbestos. Cut shows Monarch Arundel drop front type. Doors can be on one side or two; any capacity; oil, gas, coal or coke fuel.



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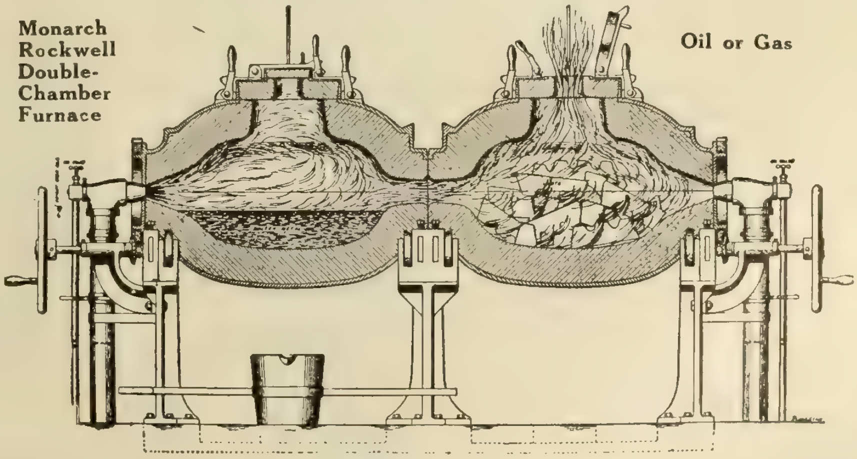

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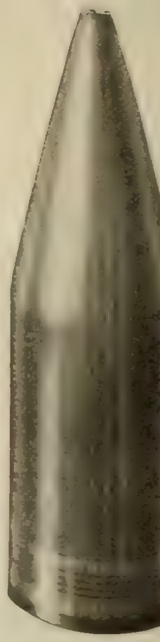

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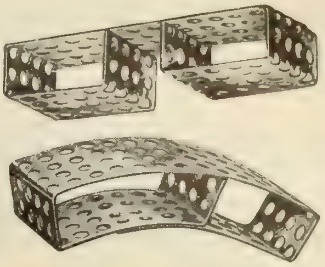

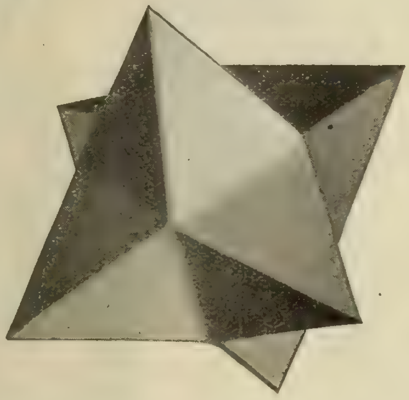

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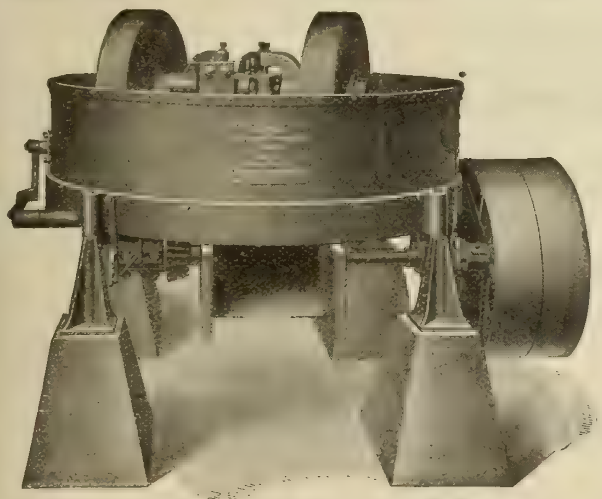

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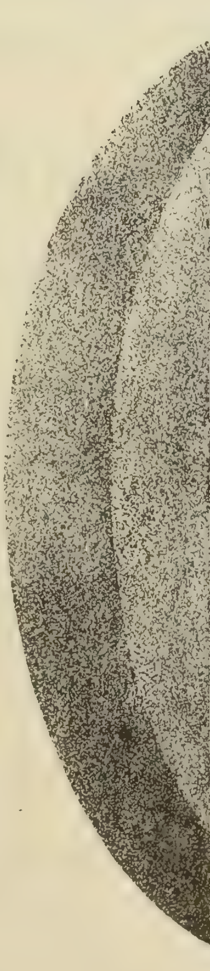

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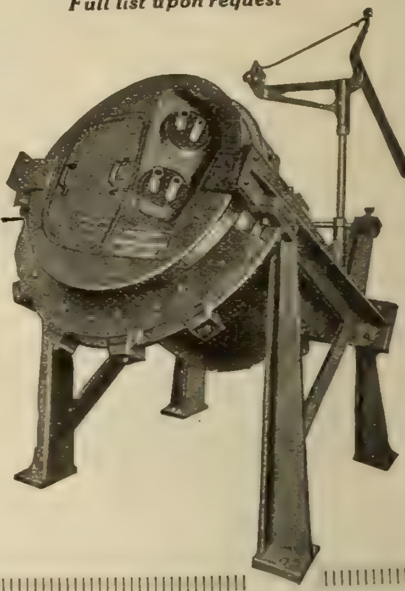

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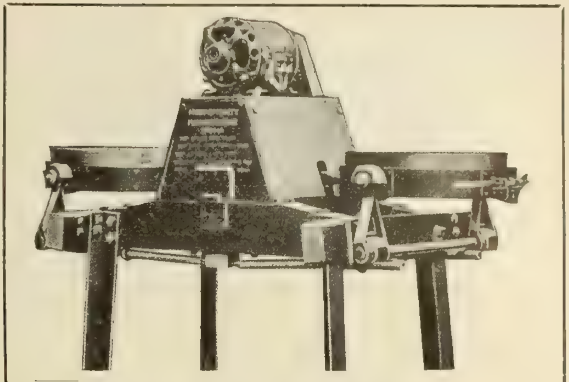

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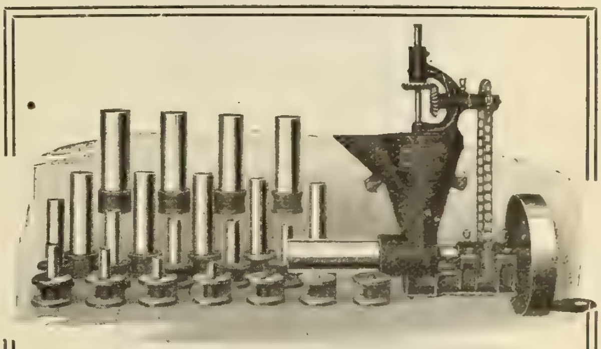

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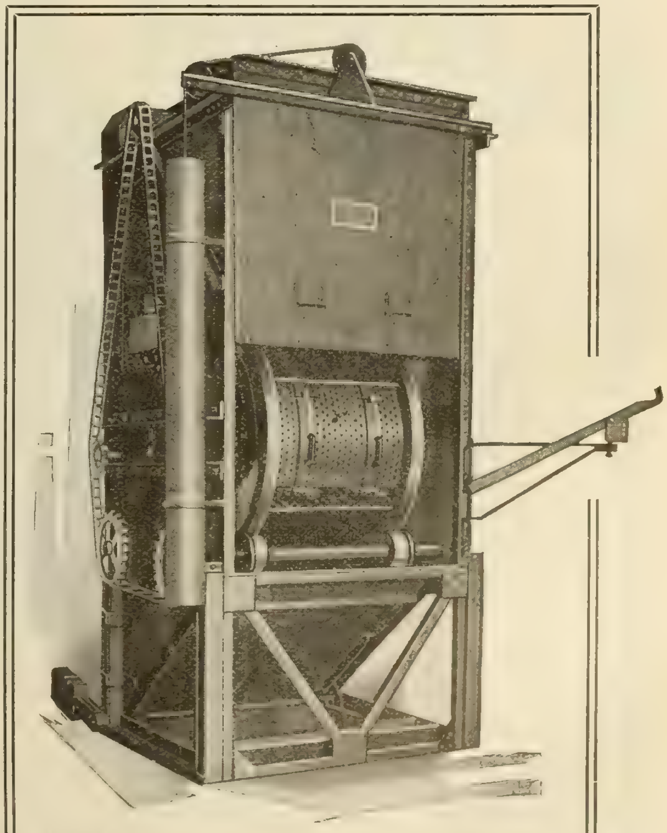

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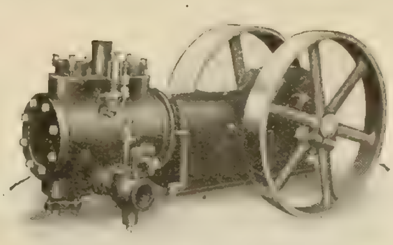

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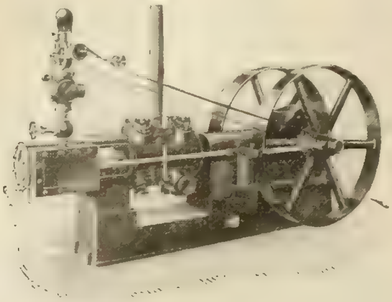

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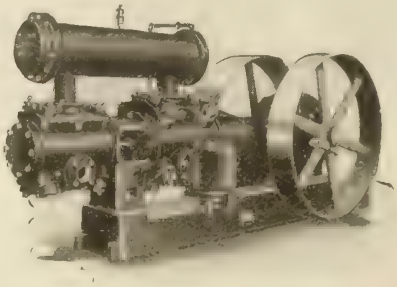

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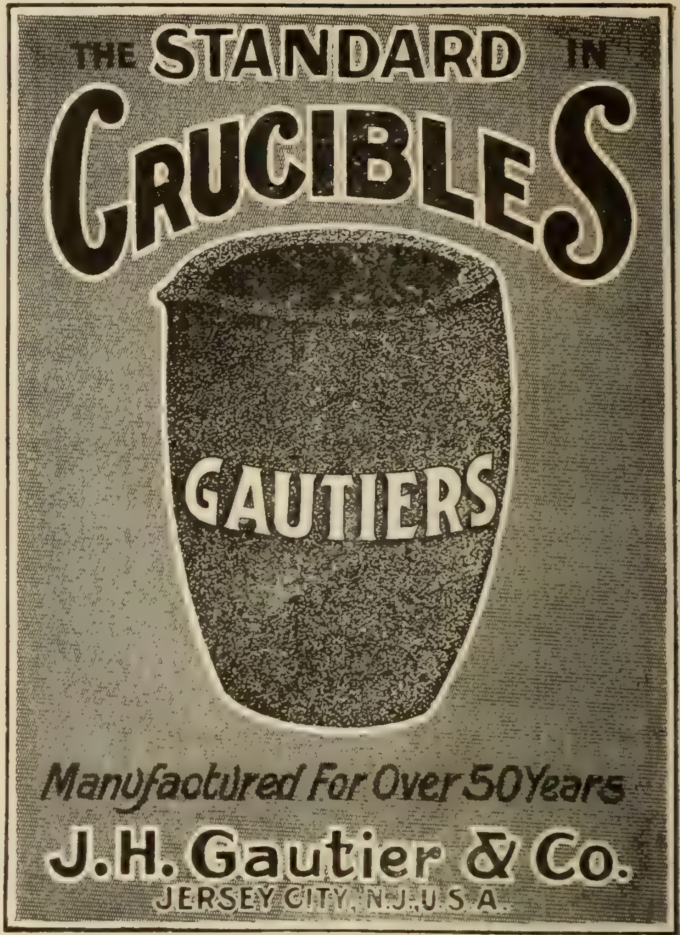

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THE HOME OF STELLITE

STAFF ARTICLE

No better illustration of the potentiality of Canada can be offered than that of her mineral resources. While the glamour of enormous wealth will always attract attention to gold and silver deposits, the attention of students of world progress is frequently more interested in discovery and research savouring of alchemistic mystery. The substance which has prompted this article is of the latter category.

FROM time immemorial, the noble metals have exercised a fascination over mankind, the length of the spell being only equalled by the completeness with which it has influenced national and individual actions in all stages of the world's history.

In progress of time, however, the absolute values of metals to mankind have undergone more or less readjustment. Intrinsically and individually, gold, silver, etc., may be of more immediate monetary value, but in the industrial or utilitarian sense, iron and steel are much more indispensable to the welfare of the human race than are the previously named noble metals. The pre-eminence of gold down through the ages, while due principally to its imperishability and attractive appearance, has also been due in part to its being obtainable in the raw state without requiring much treatment in the way of refining, until the demands of modern commerce caused effort to be made to recover all of it.

Cobalt a Canadian Metal

The developments of modern metallurgical science in allied fields soon resulted in the commercial production of certain semi-rare metals which, while not competing with gold or silver as bases of currency, still possessed a high value, although their industrial applications were more or less limited at first. Prominent among such metals is cobalt. It is semi-rare in the ordinary sense of the word, its deposits are practically confined to Canada, and, along with chromium, etc., it is destined to play an increasingly prominent part in the world's future industrial development.

Stellite, one of the marvels of modern research, is a non-ferrous alloy of cobalt and other metals. Its value as a machine shop accessory material has been well proven during recent years, it having certain qualities which adapt it for use in place of high speed steel as a cutting agent. In view of its unique properties and the fact that the humblest machine operator has frequently had his earnings largely increased through its use, more than ordinary interest attaches to the plant where this metal is produced, and the views and description of processes forming this article were obtained through the courtesy of the Deloro Smelting and Refining Co., Deloro, Ont. This company operates a smelting plant which refines silver-cobalt-nickel ore from the O'Brien and other mines at Cobalt and Gowganda.

Smelting Plant

The smelter is located on the site of an abandoned gold mine, which has not been worked for the last fifteen years, and, as some of the refining operations carried on at present have much in common with those by which the gold was formerly recovered, certain portions of the old plant have been retained and are incorporated into the present smelter.

Cobalt is only found in commercial quantities in Canada, and since the company, in addition to the manufacture of stellite for the Canadian and export trade, also refines the cobalt used in the manufacture of stellite in the United States, it will be of interest to give a

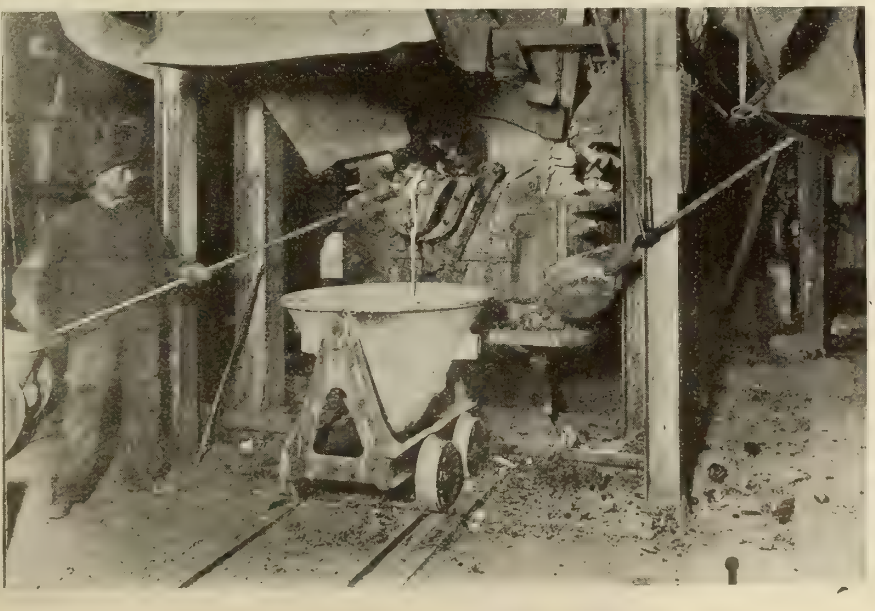


FIG. 1. SLAGGING OFF, SILVER FURNACE.

brief account of some of the steps used in the reduction of the silver-cobalt-nickel ore.

The ore from the mines mentioned above is first ground in ball mills to the proper fineness, a certain portion being automatically set aside for testing and assaying and the bulk of the material going into storage lines.

From the storage bins the ore passes to blast furnaces where coke and the necessary fluxing materials are added. These blast furnaces are of a design suitable for the material handled and are somewhat similar to those used in the reduction of copper ores. The products of the blast furnaces are, arsenic fumes, which pass to bag-houses for collection, slag which is dumped, and speiss which contains the cobalt, nickel, silver and some iron and copper. In addition some silver is recovered at the blast furnace as base bullion and goes direct to the silver refining furnaces. Fig. 1 shows the slagging off of the blast furnace preparatory to the tapping off of the speiss, shown in Fig. 2.

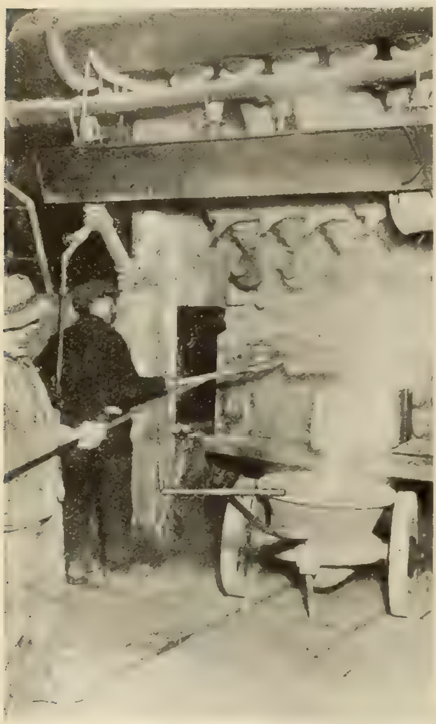


FIG. 2. TAPPING SILVER FURNACE.

The speiss is given a further treatment of crushing and roasting to drive off the remaining arsenic; chlorodizing and cyaniding, the result of which is the freeing of silver in the precipitated state and the leaving of the other metals in the residue.

Silver Refining

This precipitated silver is then taken to the bullion furnace room, where it is graded with the base bullion, refined, and finally melted for pouring into ingot molds, as shown in Fig. 3. This furnace is of the Swartz oil burning type, provided with trunnions and a geared tilting arrangement. In all about 150,000 troy ounces of silver are refined each week.

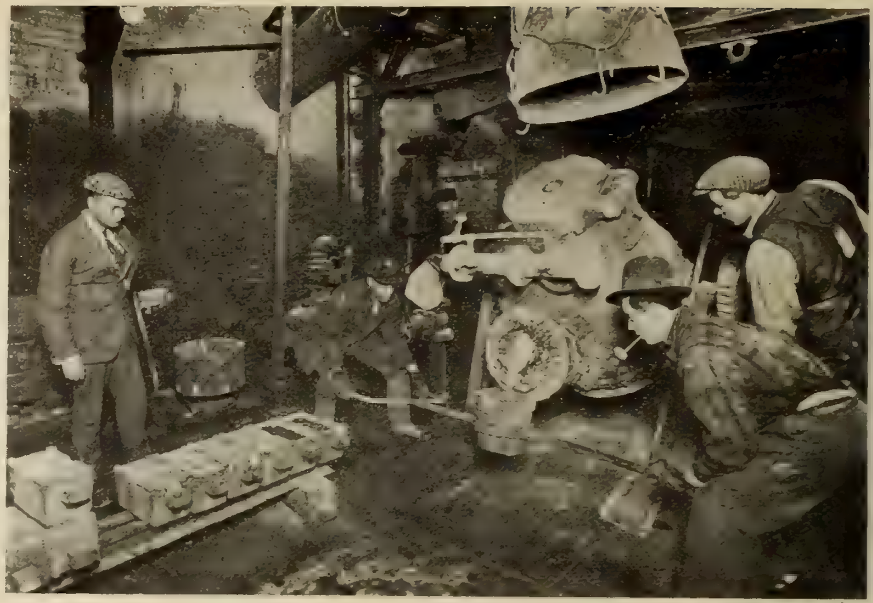


FIG. 3. POURING BULLION IN THE SILVER REFINING PLANT.

The arsenic fumes given off at the blast furnace are carried to cooling chambers, where the crude arsenic partially settles out, the remainder being led to bag houses, where it is completely removed from the blast furnace gases. The crude arsenic is periodically removed from the bag houses and chambers, and is charged to the arsenic refining furnaces, where it is again volatilized and passes into the white arsenic chambers in which it is condensed and from which it is packed for shipment.

The residues left after extracting the silver form the source of supply for the cobalt oxide plant. In this plant the cobalt and nickel oxides are produced and shipped to England, France, United States, etc. The operations in this department are purely hydro-metallurgical; in other words, it is a wet plant.

The residues are first processed in such a way that the metal content is rendered soluble. The next step in the process is the separation of the cobalt and nickel by precipitation. The tanks in which these operations are carried on are shown in Fig. 4, which also shows the filter presses used for dewatering the precipitated sludge. The clear solution finally remaining after the precipitation of the cobalt and nickel is allowed to run to waste, as it contains no values.

The press cakes of cobalt and nickel are refiltered, dried again, ground and packed ready for the market. Fig. 5 shows the Raymond grinding and packing machines by which the cobalt and nickel oxides are prepared for shipment. All material is carried through these machines by a

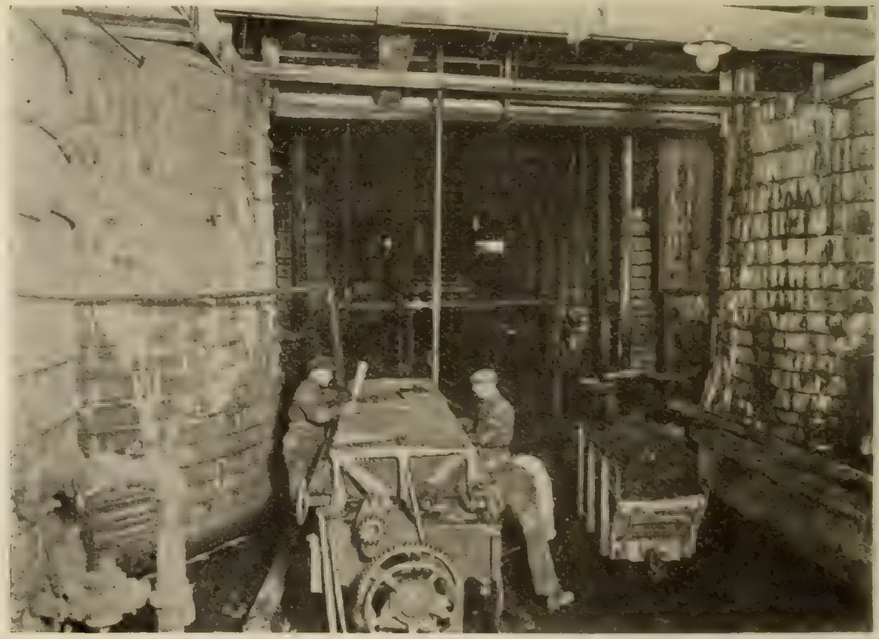


FIG. 4. COBALT OXIDE PLANT; STRIPPING FILTER PRESS.

pneumatic system, the details of which will be understood by reference to Fig. 5.

Stellite and Metals Department

The metals department derives its supply of raw material from the oxide plant. The oxide is first reduced and is then charged into the electric furnaces where it is melted, the procedure for cobalt and nickel being similar. The form in which these metals are prepared for the market is similar to shot, and for cooling of the molten metal in this form an ingenious device is used which breaks up the molten stream from the pouring ladle into small particles not necessarily round. This device, which is shown in Fig. 6, consists of a circular tank 4 feet in diameter by about 6 feet deep. The 1½ in. pipe shown has two flat nozzles, above the tank waterline, through which water is forced at a high velocity. These jets serve to break up the molten metal into particles of the desired size. The metal in shot form is caught by a basket or screen in the bottom of the tank and is removed after the melt is finished.

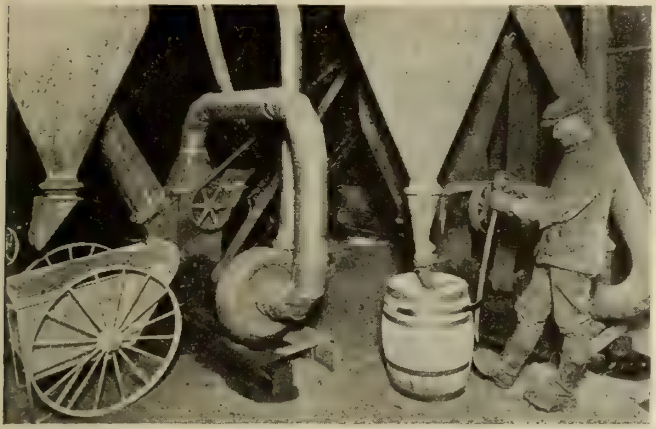


FIG. 5. PACKING COBALT AND NICKLE OXIDE.

Cobalt in shot form obtained in the above process forms one of the principle ingredients of stellite, and it, together with the proportions of chromium and tungsten for the different grades of stellite, is placed in the electric furnaces used for stellite manufacture. These furnaces, shown in Fig. 7, are of the Snyder type and are of 50 K.W. rating. The Snyder electric furnace has a vertical 3 in. carbon electrode mounted in the center above a magnesite hearth, with means for its manual raising or lowering to suit the depth of charge and for the adjustment of the electric current.

The furnace is started by striking an arc, and the heating takes place by the utilization of the resistance of the charge as well as by arc action. In operation these furnaces take from 80 to 100 amperes at 50 volts, single phase.

In this connection mention might be made of the furnace in which stellite was first produced in Canada. This furnace, which is still used for experimental and research work is shown in fig. 8. It is single phase and it will be noticed that two carbon electrodes are provided, the arc being struck through the material on the hearth. A double throw switch is provided, by means of which voltages of either 50 or 100 may be impressed between electrodes. This furnace is of 25 K.W. capacity and the increased demand for stellite in the past two years has necessitated the building of the two 50 K.W. furnaces now used for stellite alone.

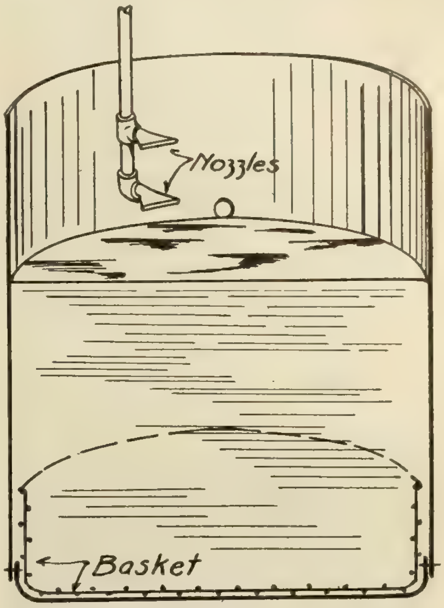


FIG. 6. METAL SHOTTING TANK.

Pouring

When the charge is melted the furnace is tipped forward on its trunnions, and the molten stellite is poured into a graphite crucible from which it is poured into the graphite moulds. Stellite has a high melting point, about 1,900° C (3.452° F), and considerable care must be taken to skim off all slag and foreign matter.

An interesting device, shown in Fig. 7 facilitates the pouring operation. The

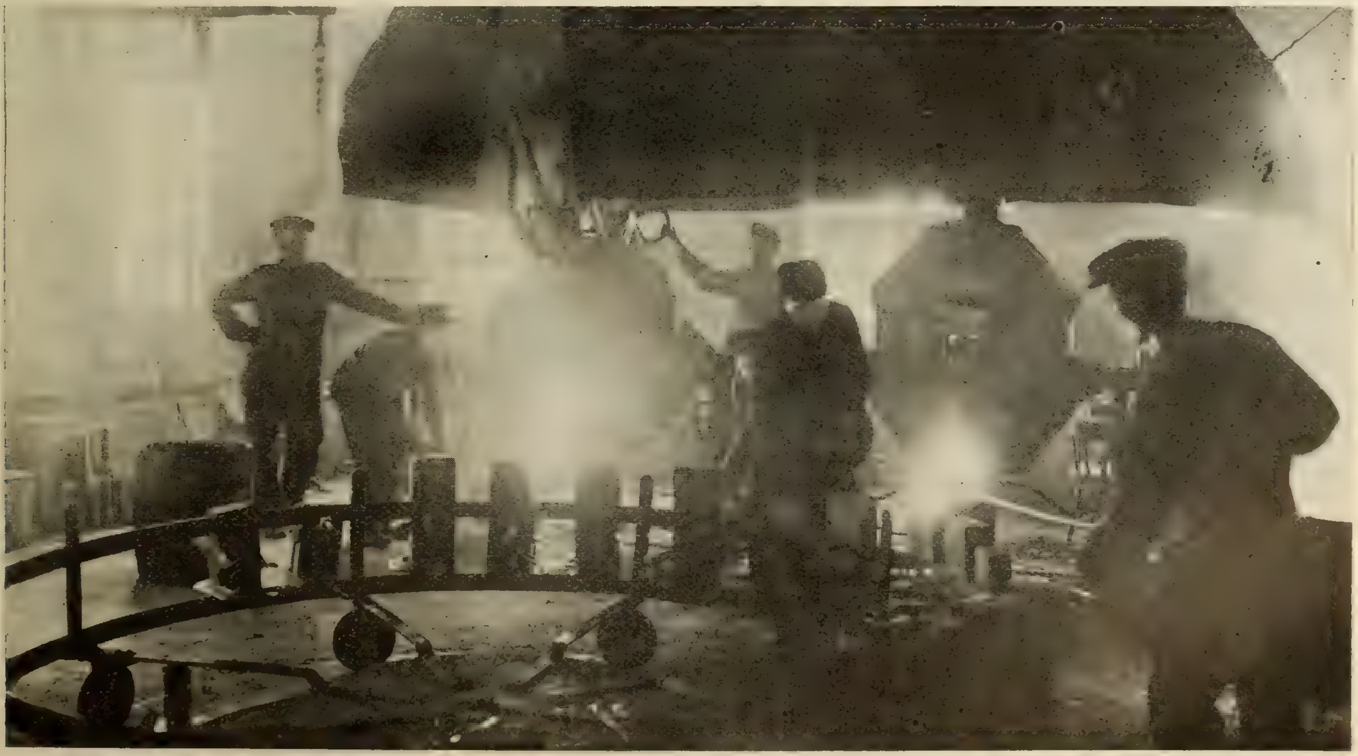


FIG. 7. MOLTEN STELLITE AT A TEMPERATURE OF 3,500 DEG. F. BEING CAST IN GRAPHITE MOULDS.

graphite molds, held together by clamps, are firmly fastened to a circular frame made of flat and angle iron, the angle iron forming a ledge for the bottom of the molds. This frame is carried on wheels running on a circular track in the floor, and enables the operators who are pouring to stand in one place and serve the molds as they are brought around to the proper position.

Mould Shop

The mould shop is in many respects similar to the average machine shop or tool room, most of the tools being required for the working up of graphite slabs into the various shapes required for the graphite moulds. The slabs are first sawn into the required sizes on a band saw and are then shaped on a 20 in. Kelley shaper to a contour which will give the proper cross section when the halves of the mold are clamped together.

FIG. 8. EXPERIMENTAL AND RESEARCH FURNACE.

A 15 in. gap lathe and an 18 in. MacKenzie lathe form part of the equipment.

When the stellite has cooled sufficiently the molds are taken down and the bars removed, fins and sprues being broken off. In the next operation the bars are nicked in an Armstrong cutter and broken into the required lengths.

This cutter, shown in Fig. 9, consists of a stand of box section, carrying bearings and a horizontal shaft, on one end of which a disc of steel 1-16 in. by 16 ins. in diameter is mounted between two ⅜ x 14 in. covering plates. The stellite bars are brought into contact with the cutting disc by a swinging table having a ledge on its upper surface for engaging the bar. The actual nicking is not effected by a cutting action but by the heat generated through the friction between the rapidly revolving disc and the stellite. This heat is so great that the metal is melted at the point of contact and the disc consequently has only to remove the molten metal, and by so doing clears the dividing groove.

As the greater part of the steel disc is at all times out of contact with the metal and is being continuously cooled by contact with the air, and as each point on its circumference is only in contact with the metal for a minute fraction of a second during each revolution, the disc remains at all times comparatively cool and does not melt. After the bars have been nicked and broken to length they are ground and polished on the grinders, also shown in Fig. 9.

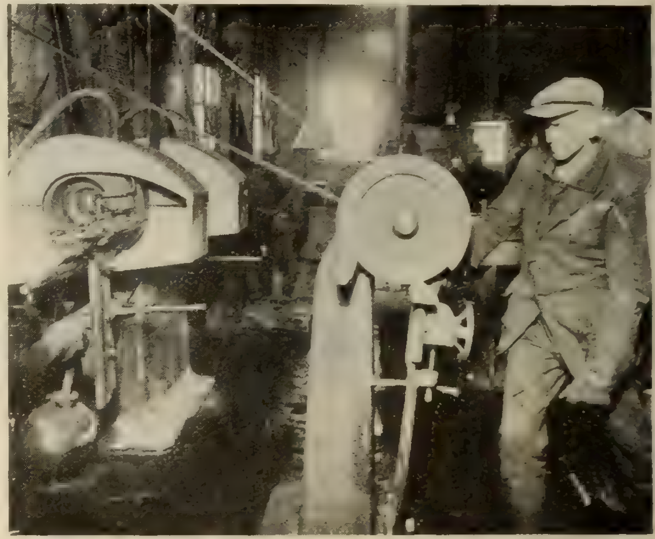


FIG. 9. CUTTING STELLITE BARS WITH STEEL DISC.

Inspection and Packing

A test bar is taken from each melt and is tried out and tested on a test lathe where the quality as regards speed and depth of cut is determined. Each melt also undergoes a sceleroscopic test and is subjected to laboratory analysis.

Qualities

Stellite cutting alloy requires no tempering, no cutting compound, and may be used at a speed that would be impracticable for high speed steel, best results being obtained when working the tool at a red heat.

The following table gives the surface speed at which stellite should be used, the same depth of cut and feed being maintained as for high speed steel.

Material—	Surface Speed per Min.
Mild steel to 30 pt. carbon—	
Use No. 1 grade stellite	130 to 300 ft.
Hard steel, 35 to 100 pt. carbon	
Use No. 1 or 2 grade stellite...	100 to 200 ft.
Soft cast iron—	
Use No. 2 or 3 grade stellite...	200 to 350 ft.
Hard cast iron -	
Use No. 3 grade stellite	100 to 250 ft.

Forms and Shapes

The manufacturers recommend personal demonstration and instruction in order that the best results may be obtained and the proper methods used.

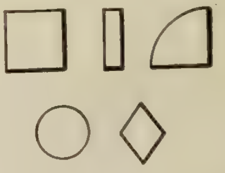
In addition to the usual square and flat sections a variety of special shapes are made, a few of which are shown in figs. 10 and 11. The circular cored section shown in Fig. 11 is made specially for a Canadian manufacturer and is held in a special tool holder in such a manner that when one portion of the cutting edge becomes worn the bit may be turned in its holder, presenting a new portion to the work. When the whole edge becomes dull the bit is ground off until the edge is even all around its circumference, and a conical wheel is then used to bring this new edge to sharpness.

In the smaller sizes formed cutters are made of solid stellite, being ground to the correct contour from the rough. This method is not so economical for the larger sizes, and built up cutters are preferred when the width exceeds ¼ in. These cutters are made with a carbon steel body and inserted blades of stellite, thus obtaining the strength of steel and the cutting powers of stellite. The inserted teeth may be held in place either by the usual method or by welding.

Stellite is fabricated into tool bits by welding a stellite tip on a machine steel shank. For this work either electric-arc or oxy-acetylene welding may be used with good results.

Electrical Installation

Electrical energy for the electric furnaces and all other plant requirements is obtained from the Seymour system of the Hydro-Electric Power Commission of Ontario. The smelter receives power through a 3 phase 60 cycle 44,000 volt transmission line, which enters the substation through wall bushings on the second floor. The accompanying cross-sectional elevation, Fig. 12, of the substation will serve to show some of the interesting features of this installation.



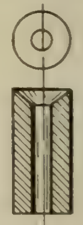


FIG. 10. USUAL STELLITE SHAPES.
FIG. 11. SPECIAL SHAPE.

The building is of fireproof construction with hollow concrete block walls, and with steel and concrete floors and roof. The upper floor is used for a lightning arrestor and high-tension switch room, and the lower one for transformers and switchboard.

The electrical installation is protected by a set of General Electric type I electrolytic lightning arresters provided with disconnecting switches for their isolation when being worked upon. From the line entrances the leads pass through choke coils and disconnecting switches to the General Electric type K high-tension oil switch. This switch is enclosed in a concrete cell and is hand operated from the switchboard on the floor below.

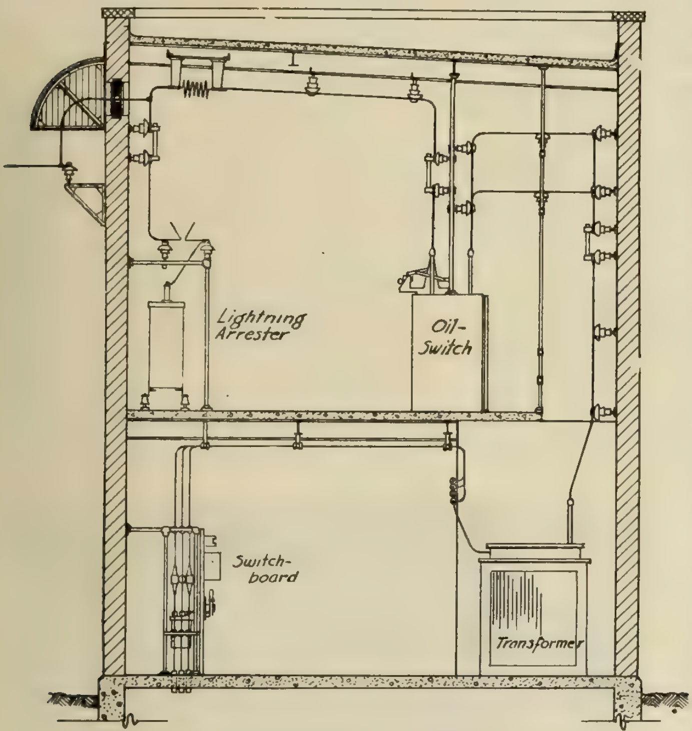


FIG. 12. CROSS SECTION OF SUBSTATION.

The transformer equipment, consisting of three Westinghouse single phase 250 K.W. 44,000/600 volt 60 cycle transformers in separate concrete compartments, Fig. 13. These transformers are delta connected on both high and low tension sides, and the high tension side is provided with disconnecting switches by means of which any transformer may be cut out of service and the other two operated on open delta when the secondary side is opened as well.

The three panel switchboard is equiped with a C. G. E. type F form K 2 600-volt 1,000 amp. oil switch on the secondary side of the transformers, from which the single, three-prase feeder passes underground to the company's pole line for distribution to the plant. Both the high and low tension switches are provided with C. G. E. inverse time limit relays. A Westinghouse graphic recording wattmeter meters all the plant load, a Westinghouse type E integrating wattmeter being also provided. A General Electric horizontal edgewise ammeter with ammeter plugs and a similar type voltmeter on a swinging bracket are part of the equipment.

Laboratory

A laboratory, with all the various apparatus necessary for the control of operations in a metallurgical plant of this character, is housed in a separate building by itself, and it is in this building that all the assaying of ores and other necessary control testing is carried out.

For this purpose a furnace room is provided where all cuppellation of the ores is carried out for the determination of their silver content. The rest of the laboratory is divided off into separate sections such as the office, hydrogen sulphide room, a room for sulphur determination, a balance room with four chemical balances and an office for the chief chemist. Two wet rooms, where general chemical analysis is carried out are also part of the laboratory, and an interesting portion of one of them is shown in Fig. 14.

The piece of apparatus shown in this illustration is for the determination of cobalt and nickel in the sampling of ore and furnace products by electro-chemical analysis. Four glass beakers containing known quantities of the solutions to be analyzed are placed on stands under the rotating glass rods. These rods are rotated by a motor, as shown, for the purpose of securing a faster deposition of the metals through the stirring of the solution. After the required metal has all been deposited out of the solution it is a simple matter to determine the various proportions of the metals present in the materials tested.

STELLITE AND SOME OF ITS USES

WHILE stellite has come prominently before the engineering industry as a cutting material, its present applications are not limited to tool work, while increased supply and experience in its manufacture are expected to disclose further uses and additional alloys. In a recent article in the "Canadian Chemical Journal" the discovery and development of stellite and the circumstances attending its production in Canada are recounted by Thomas Southworth,* who writes as follows:

In 1910 a business correspondent of Swansea, Wales, in writing us regarding Cobalt matters, enclosed a clipping from an English paper that he thought would be of interest to the writer. This clipping was a reproduction of an article that had appeared in an Australian paper referring to an address made by a Mr. Elwood Haynes, of Kokomo, Indiana, before a chemical society in San Francisco. As the article in question stated that Mr. Haynes had discovered a new alloy of cobalt, it naturally was of interest, and I made inquiries as to Mr. Haynes through a friend in Kokomo. I then got in touch personally with Mr. Haynes, who had been anxious about a supply of cobalt, with the result that he came to Toronto, and Mr. Haynes and the Deloro Smelting and Refining Company linked up together in the development and production of the alloy.

Up to this time cobalt, which had been known for centuries, had been produced mainly in the form of an oxide and used almost exclusively in the ceramic arts. Originally found in Saxony and subsequently in limited quantities in New Caledonia, the large production from the cobalt silver mines flooded the market, and cobalt oxide was at that time un-

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*Managing Director, Deloro Smelting & Refining Co., Ltd., Toronto.

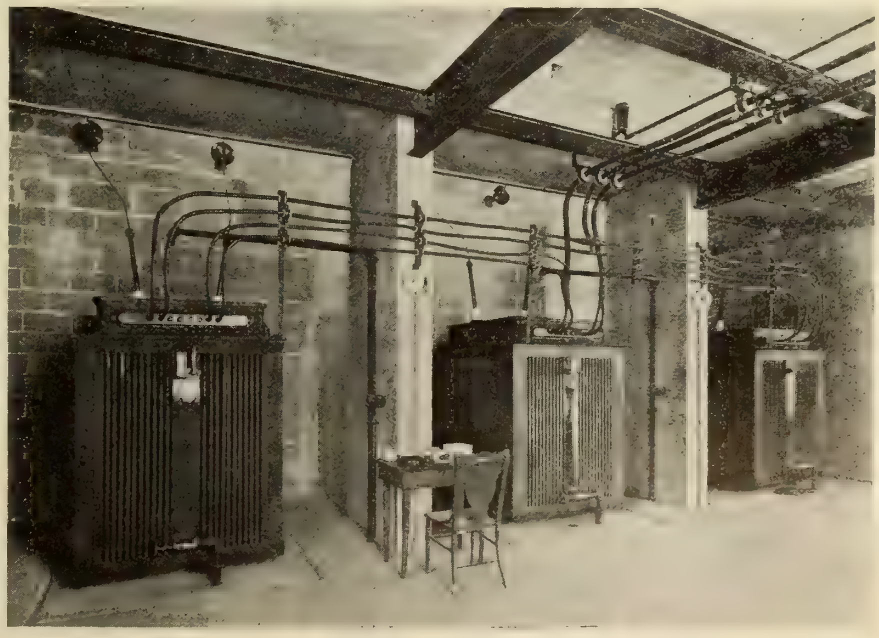

FIG. 13. TRANSFORMER ARRANGEMENT IN SUBSTATION.

saleable except in comparatively small quantities. Naturally, therefore, any new development that was likely to produce new uses for cobalt would be of interest to the Deloro Smelting and Refining Company, one of the largest producers of cobalt in the world.

On meeting Mr. Haynes I found that he was not only a metallurgist, but an inventor and manufacturer, who had to his credit the production of the first practicable gasoline motor car in the United States, and was then manager of the Haynes Automobile Company, makers of a well-known car.

In his spare time Mr. Haynes devoted himself to metallurgical research, and as a result of numerous experiments he found that cobalt, although apparently similar to nickel, possessed quite different qualities in many ways, and at the time his paper on "Cobalt Alloys" was delivered he had produced an alloy of cobalt and chromium that bade fair to supersede steel for some purposes. This alloy Mr. Haynes called "Stellite," for the reason that when polished it took on a particularly brilliant lustre, hence the name "Stellite."

In addition to its brilliant color, which made it a very attractive looking metal for cutlery purposes, it was stain-proof and rustless. Stellite alloys resist oxidation or tarnishing better than any known metal excepting gold and the metals of the platinum group. It is absolutely immune to all alkaline solutions, and practically so to all chemical salts, including solutions of bichoride of mercury, iodine, etc.

Mr. Haynes states that a stellite bar was subjected to the action of strong, cold hydrochloric acid for thirteen days with a loss of .009 grams. The action of dilute sulphuric acid is slightly more pronounced. Nitric acid has no effect on the metal whatever. Fruit juices and acids do not discolor stellite, even though allowed to dry on the polished surface.

Physical Properties

In point of hardness, the binary alloy, consisting essentially of cobalt and chromium, can be forged with difficulty at a bright red heat, but when it becomes cool, its hardness remains as great as before the first heating. The metal is somewhat stiffer than steel, and notwithstanding its great hardness, it still shows considerable elongation. The alloy can be made in great variety of hardness and toughness, not only by changing the proportion of its constituent metals, but by adding small quantities of other metals. By this means untarnishable alloys can be made which vary in hardness from about that of common, untempered steel, to that of quartz crystal. In fact, one of our stellite alloys is so hard that it will readily scratch the hardest and toughest steel ever produced. The unique and peculiar properties of stellite alloys may be summed up in the statement that the alloys combine a greater range of hardness than steel, with the resistance to oxidation of platinum and gold.

The original stellite produced in Kokomo and at Deloro, and intended for cutlery purposes, was found on being tested in Sheffield, England, by cutlers that, although the metal possessed many excellent qualities in the way of appearance and freedom from stains, it was so hard as to be—while not entirely unworkable, so nearly so as to be impracticable for the purpose. Mr. Haynes at once set about developing other alloys, and about two years ago produced a stellite used as a metal cutting tool, and this material, manufactured in Kokomo, Indiana, by the Haynes Stellite Company, and in Canada by the Deloro Smelting and Refining Company, has proven a very great success. It is quite generally in use in the United States, Canada, Great Britain, France and Italy, and there is no doubt that its use in Canada has to a very considerable extent been instrumental in increasing the output of large and small shells in our Canadian factories. The material does not lose its temper even though heated to a white heat, but retains its cutting qualities under these conditions. This makes possible a much greater cutting speed than can be obtained with any other metal, hence the increased output by the use of stellite.

Mr. Haynes has more recently developed a new alloy called Festal Metal, being a combination of stellite and iron, that will shortly be placed on the market for cutlery purposes. This metal has all the non-rusting and non-staining qualities of the original stellite, while it is much more malleable and possesses a greater elasticity than the original alloy. He has further produced a malleable stellite, which is to some extent taking the place of platinum in laboratory appliances, as well as for other purposes.

The present writer not being a technical man is unable to give other than a general statement of the various stellite alloys and their uses, but the following from a paper recently read by Mr. Haynes will give a better idea of the nature and character of these alloys.

Practical Applications

First, it may be said that these alloys are not fixed or definite in their composition, and may be divided broadly into two classes: (1) those malleable at a red heat; and (2) those which can be worked into the desired form only by casting.

The malleable alloys are composed almost entirely of cobalt and chromium only, though the proportion of the constituents may vary from 10 to 50 per cent. chromium, with a corresponding variation in the cobalt. These alloys are all hard, and while they may be scratched by the file, none of them is practically workable by this means. They cannot be machined, but some of the softest ones may be drilled by means of a hard-carbon steel drill or a drill composed of hard stellite. They resist nitric acid almost perfectly, even when boiling, particularly if the chromium content is over 15 per cent. They forge with difficulty at temperatures ranging from 750 to 1,200° C.

They have been forged into the following forms:

(a) Tableware, such as spoons, forks, knives, ladles, etc.

(b) Surgical instruments, pocket knives, dental instruments, etc.

(c) Evaporating dishes, crucible supports, lamp stands, etc.

(d) Jewelry, including finger rings, cuff buttons, scarf pins, etc.

These malleable alloys are all slowly attacked by either hydrochloric, sulfuric, or hydrofluoric acid, but are nearly immune to all chemical combinations, as well as the fruit acids. As the evaporating dishes made of this metal take a bright polish, and can be made of comparatively light section, they will prove suitable for evaporating many chemical salts to dryness, and are particularly suitable for boiling the caustic alkalies. Substances may be evaporated to complete dryness in these vessels without any danger whatever of breaking the vessel, since the tensile strength of the alloy exceeds 100,000 pounds to the square inch, and it also shows considerable elongation before rupture. When a vessel made of this material is struck by a hammer, it emits a clear, musical tone, and continues to vibrate for a considerable length of time. The vessels retain their lustre in the chemical laboratory under practically all conditions, since they are not affected in the slightest degree by sulfuretted hydrogen, ammonium chloride, or other vapors. Furthermore, they are practically immune to acid vapors. They give most excellent results in the form of lamp stands, supporting rings, triangles, etc. When these are heated to full redness, they become covered with a deep blue-black film, which does not change either in weight or appearance by repeated heating, and as no scale ever forms, these articles retain their weight, stability, and smooth surface indefinitely under all sorts of use. They can be subjected to temperatures up to 1,200° C., and still retain a considerable amount of strength. In

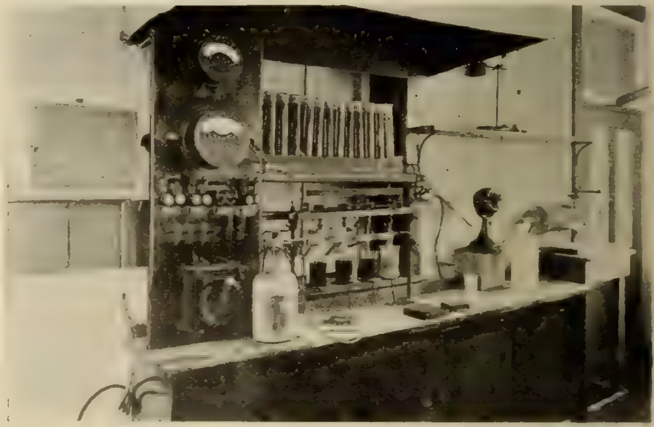

FIG. 14. ELECTRO-PLATING OUTFIT USED IN ELECTRO-CHEMICAL ANALYSIS.

fact, the stellite alloys possess the highest "red hardness" of any of the alloys yet discovered.

A Canadian Product

While stellite was discovered and developed by an American, the alloy may be considered as distinctly Canadian. All the stellite so far manufactured has been made from Canadian cobalt, and, as is generally known, Canada possesses the largest supply of cobalt at present known, and this position will likely be maintained for some time. Until the deposits of this metal at Cobalt were opened up very little incentive existed for research work in this line owing to the scarcity of the metal and its very high price. Cobalt had for years varied from $4.50 per pound of oxide to $2.50 per pound, which was the price obtaining when the Cobalt camp was opened. The price very quickly dropped to 75 cents, and without sufficient market to absorb the output of the Canadian refineries.

The first alloy of consequence that has so far been discovered is stellite, but no doubt the reasonable price of this metal, and the increasing supply will induce investigations that will disclose new uses and new alloys. One of these new uses is for a light weight metal to replace the household utensils imported hitherto from Hungary.

It may be stated that cobalt is being used to a limited extent in the production of the better grades of high-speed steel.

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THE INDUSTRIAL SLACKER

By R. H.

MORE titles and honors have probably been conferred during the past three years than in any other similar period of the world's history. War is invariably a productive factor for heroic achievement. Honors are generally associated with recognized acts of bravery in the face of extreme danger. Titles, on the other hand, are usually bestowed for faithful service to a specific cause or purpose. A title or phrase, however, that reflects upon the character of the party upon whom it is conferred, is that of the odium "slacker." While this expression is primarily intended for those young men of military age that are practically free from domestic or business responsibilities and who have refrained from joining the colors, the implication is none the less applicable to many of those who at the present time are engaged in essential industrial activities.

Conscientious objection is a term often used by men to obtain exemption from military service, but few of these men show any compunction about accepting a job in a munition plant making shells at from $6 to $8 per day. Conscience, however, is a very pliable characteristic and can generally be moulded to suit the varying conditions in which we often find ourselves. Circumstances like the present demand that every man should conscientiously analyse his individual faults and failings so as to put himself right respecting his own responsibilities and his obligations to those of his countrymen who have accepted the challenge to give their lives, if necessary, for the cause of right and justice. If it is not permitted for us to take up the more arduous duties of the soldier and we find ourselves in a position where our efforts are devoted to the production of materials for the comfort and protection of these men, it behooves us to adapt ourselves to the situation so that in no sense can the term slacker be rightfully applied.

A notable feature in connection with the making of munitions is the progressive method of production. The routing of a shell during the machining operations has become one of the efficiency factors in the manufacturing problem. The successful solution, however, was often a matter of considerable concern to the various plant executives owing to the many difficulties contingent to maximum output and the vagaries of the human element. During the period of greatest activity, when the man problem was of much importance, the "floating" of machine operators caused considerable inconvenience. The high wages that were paid to the operators at that particular time was one of the chief reasons for the indifference of many employees. Taking a day off was a frequent occurrence for many men who were receiving double, or possibly treble, what they had ever done before. These men failed to realize that their absence often meant the temporary disorganization of the work in the shop as it was seldom possible to have certain machines idle when working to capacity.

During a visit to a large plant last summer the writer was told by the superintendent that during a certain race meet at a track about a quarter of a mile from the factory in the outskirts of a large city, that he was greatly handicapped by the men leaving at noon to attend the races, often as many as 5 to 10 per cent. of the men being present. The isolation of the plant and the inability to get new men to locate made it difficult to reproach the workmen for their neglect and indifference. Thus it is that the term slacker, apart from the meaning that it generally implies, can be very readily and rightly applied to many who are priding themselves on "doing their bit" in the manufacture of munitions and other essentials, but who in reality are only working for the abnormal remuneration made possible through abnormal conditions.

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SCIENCE AND INDUSTRY

By M. L.

THE formation in Sheffield of the first Association of Metallurgists and the Metallurgical Chemists means more than appears on the surface. It is perfectly true that the importance of applied science in the national organization has long been recognized by all thinking men in the industrial world, and that the alliance of the two has achieved notable triumphs, but whilst one of the primary objects of the new association is, very naturally, to make that alliance more effective and to lead to a broadened outlook and a freshening of ideas, it stands, if we mistake not, for something more.

The metallurgist and the metallurgical chemist should be inseparable allies. The path they together tread is broadening to a degree little anticipated, probably, before the war, and the return of peace will quicken not retard this development —a fact that is every day becoming better understood. There are great possibilities in front of the iron and steel and kindred industries, but a full realization of them may only be secured by the maintenance of a high scientific standard and more intimate contact between the scientist and the official responsible for the actual operations in the works.

Never before has the importance of the work's laboratory been so generally recognized, with the result that the number of firms adding a staff of chemists to their establishments is rapidly increasing. But those laboratories cannot be staffed at will, especially in these days of military demands. Metallurgical chemists are not kept hanging on pegs behind the door of a labor exchange. The danger is, therefore, that through the present urgent request for such men there may be a lowering of the standard of efficiency demanded in normal times, with consequent injury to the reputation of a profession that ranks high in the list. This, we fancy, is where the association seeks to come in. The only entry to it is ability, but that condition is to be insisted upon. Nevertheless, provision is to be made for a student section, which apparently will be open to every young fellow of the right stamp. The aim of the association is to lift up, to encourage study and healthy ambition, and to assist in the development of the application of science to the industries with which its members are associated.

The association will work in harmony with the Institute of Chemistry, five Fellows of which, we observe, have accepted seats on its council, and with the recently-constituted British Association of Chemists. We regard it as one of the most important developments of the Sheffield iron and steel industry and look for the formation of similar associations in other steel centres with a federation of the whole.

◆

A NEW high-speed steel has been patented by a German company. The patent specification states that the steel shall contain carbon, 1.2 per cent.; manganese, 1.2 per cent.; silicon, from 0.1 to 0.3 per cent.; chromium, from 3 to 10 per cent., and cobalt, 1.5 per cent. This material is said by the inventors to be an improvement upon a similar steel which they patented last year containing molybdenum. In its manufacture the molybdenum is omitted, and the percentage of manganese and chromium is increased.

◆

SATISFACTORY results, it is reported, are being obtained from the plant erected at Risden, Tasmania, for the electrolytic production of zinc from Australian ore and concentrates. The plant is said to have at present a capacity of 15 tons per day, and obtains the necessary electric power from the state's Great Bear hydro-electric installation.

Role of Chrome Vanadium: Its Position Among Alloy Steels *

By F. J. Griffiths**

Simplicity of heat treatment, wide range of permissible temperatures, and the possibility of procuring almost any desired physical properties to suit different industrial applications have caused chrome-vanadium steel to be the object of much investigation and research. The writer discusses the properties, processes and applications in concise and lucid manner.

CHROME-VANADIUM steel holds the position virtually at the head of the commercial alloy steels and owes this prestige to the extremely wide range of physical qualities which are capable of being developed from this metal by proper methods of heat treatment. Like all alloy steels it is, as its earlier name signifies, a special steel, meaning not only that it is designed for special purposes, but also, that its preparation for the particular work it is called upon to perform must be carried out along certain lines calculated to yield in the final result, those qualities which shall represent 100 per cent. efficiency in the final product. Many specifications to-day allow a variation of 1 or 2 per cent. in the elongation, and restrict also the ultimate strength and yield point to extremely narrow limits. Examination of these specifications alone would serve to show the wide range of qualities of chrome-vanadium steel, and the absolute delicate accuracy with which by proper management it may be put into condition to perform its highest functions.

Its Composition and Structure

Chrome vanadium combines in such a manner with iron that the separate constituents of the final alloy produced cannot be distinguished, regardless of the methods selected to separate them. Whether we adopt mechanical means or use the microscope under large magnification the result is the same. This phenomenon indicates a quite strong combination between the alloying elements and defines the combination unmistakably.

Until recently little investigation has been ventured to ascertain the definite properties of chrome vanadium, and the advantages secured by this alloying element were relatively unknown except to a favorite few who, through their own research work, acquired intimate knowledge of the characteristics bestowed upon iron by the addition of this alloy.

Chrome vanadium alloys with iron in all proportions and affects the properties to a marked degree, depending upon the percentage of chrome vanadium present. The qualities which become inherent are influenced also more or less proportionately by the amount of carbon contained. In this respect chrome-vanadium steel is a special steel in another sense of the word and cannot be judged by the same standard as the old carbon steels.

The point of view of the examiner of the old commercial steel is always that of the actual condition in which the metal exists as he sees it before him, and governed by the amount of carbon present. But this point of view has altered gradually until with chrome-vanadium steel the carbon range permissible to obtain specific characteristics has become narrowed. The presence of chrome vanadium in steel intensifies the effect of the carbon in all the best qualities, which it is capable of producing alone.

The property of soundness of the casting and ingots produced by the use of chrome vanadium induces freedom from occluded gases and greatly increases the desirable physical qualities of the forgings subsequently made from this steel, such as strength, ductility and resilience. These desirable properties are amply proved not only from the results obtained from tests, but also from the more vital trial of actual use.

Value of Special Steels

According to the old view and judging from the results of tests chrome vanadium steel, as rolled or annealed, may appear to be a worthless product. It may have, as in examples to be given later, a percentage of elongation, reduction of area, elastic limit, and ultimate strength corresponding to simple carbon steel. Stress is laid on this particularly, because there is still a large and unreasonable prejudice in certain quarters against the use of steels which have to be put in special condition, or more plainly, heat treated, before they are capable of doing their best work. Of course, as we all know, this feeling is largely giving way before the splendid performance which steels of this character are giving in service, and given sufficient time the special steels themselves will demonstrate the unsoundness of this objection, based largely upon the limitations of the older simple carbon steels.

In order to make this more definite the subjoined tests, which are in no sense exceptional, are offered. They have been selected almost at random from records for the purpose of illustration. They cover briefly four classes of chrome vanadium steel, as follows:

A steel with a composition of about 0.31 per cent. of carbon, 0.95 per cent. of chromium and 0.14 per cent. of vanadium.

A steel of 0.42 to 0.49 per cent. of carbon, approximately 1.10 per cent. of chromium, and 0.15 per cent. of vanadium.

High carbon chrome-vanadium steel of a composition of 0.98 per cent. of carbon and 1.06 per cent. of chromium and 0.12 per cent. of vanadium, and

Low-carbon chrome-vanadium steel of an analysis suitable for most strucutral purposes, namely, carbon, 0.24 per cent.; manganese, 0.69 per cent.; chrome, 1.10 per cent., and vanadium, 0.15 per cent. It is to be regretted that while we are engaged on extensive tests of the third class of material mentioned, our experimental data are not at present available for use here. However, the extreme softness and ductility of this steel in the annealed condition may be noted from the one example given. This result is rather surprising in view of the high-carbon content present. Table I gives results of tests on these steels.

An examination of these results, which are concerned only with the simplest quenching and drawing treatments, shows the versatility of chrome-vanadium steel. One comment, however, based upon a practical consideration and not upon theory, may well be made here. Test results such as these just presented are valuable only in so far as they are recognized for what they are. They represent, it is true, what it is possible to do with the metal when it is in the finished state, but they do not necessarily represent what the qualities of the metal in the final product will be, if the heat treatment is carried on under exactly the same conditions as those which obtain in the tests. When it comes to question of heat treatment of the final product, the conditions must of necessity be altered somewhat, and the treatment of each class of articles then becomes a special problem. This should not be considered in the light of admission on the part of the steel manufacturer; it should be rather conceded as the principle by which he is most willing to work.

One of the principal effects produced in steel by the addition of chrome vanadium, is to raise the temperature at which the carbides dissolve in the iron, and the temperature at which they are precipitated out of solution. This elevation of the solution temperature is quite noticeable, the carbon content affecting this temperature but slightly. When chrome is added to steel it raises the critical points on heating above the corresponding carbon-steel temperatures, but on cooling, the critical point is considerably depressed, roughly in proportion to the maximum temperature from which the steel is cooled. The higher the maximum temperature reached the lower the critical range will be on cooling. This fact serves to show the slowness with which the structural changes occur in this alloy and the additional time required for the transformation to be effected completely.

It is unnecessary to point out the practical utility in commercial practice of working with a steel, in which this slow rate of transformation can be taken advantage of by the use of higher temperatures without resulting injury to the product, and also by the fact that the steel can stand exposure at these higher temperatures without the attendant harmful effects characteristic of other steels subjected to the same conditions. In fact, chrome vanadium seems to attain its greatest combination of desirable qualities at higher treatment temperatures than would be expected from the location of its critical range, due principally to the greater length of time necessary to effect the complete transformation of its constituents into a uniform and homogeneous solid solution. This point is emphasized because certain other commercial alloy steels, although excellent in many respects, have very narrow limits of annealing and hardening temperatures, and therefore require unusual care in their treatment, a slight deviation from the correct temperatures resulting unsatisfactorily.

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*Abstract of paper read before American Society for Testing Materials.

**General Superintendent, Central Steel Co., Massillon, Ohio.

TABLE I.—PHYSICAL PROPERTIES OF STEELS OF VARIOUS CHEMICAL COMPOSITIONS.

Elastic limit, lbs. per sq. in.	Tensile strength, lbs. per sq. in.	Elongation in 2 in., %	Reduction of area, %	Brinell Hardness Number	Drawing Temperature, deg. Cent.	Remarks.
0.31 Per Cent. Carbon Chrome-Vanadium Steel						
238,000	255,000	6.5	26.0	444	200	Heated to 850° C. Cooled to 800° C., quenched in water. Reheated to 850° C. for 20 min., and cooled in air.
220,000	232,000	10.5	49.0	444	260	
178,000	193,000	11.0	50.0	444	375	
170,000	179,000	12.5	55.0	387	430	
153,000	166,000	15.0	58.0	364	485	
149,000	160,000	16.0	59.0	351	540	
130,000	146,000	17.0	60.5	340	595	
225,000	234,000	6.0	14.0	321	200	Heated to 850° C. Cooled to 800° C., quenched in oil. Reheated to 850° C. for 20 min., and cooled in air.
212,000	223,000	7.5	16.0	321	260	
206,000	212,000	8.5	41.0	321	320	
167,000	175,000	11.5	52.0	321	430	
148,000	159,000	13.0	55.0	303	485	
141,000	151,000	15.0	60.0	286	545	
130,000	144,000	16.5	62.0	269	595	
0.42 to 0.49 Per Cent. Carbon Chrome-Vanadium Steel.						
100,000	120,000	22.0	62.0	260	700	Heated to 875° C. Cooled to 825° C., quenched in oil. Reheated to 875° C. for 20 min., and cooled in air.
116,000	131,000	19.0	58.0	286	656	
155,000	170,000	15.0	45.0	387	650	
173,000	185,000	12.0	40.0	418	580	
167,000	179,000	12.0	35.0	418	540	Heated to 900° C. Cooled to 825° C., quenched in oil. Reheated to 900° C. for 20 min. and cooled in air.
182,000	188,000	11.0	32.0	444	485	
202,000	216,000	10.0	31.0	477	430	
220,000	228,000	9.5	30.0	555	375	
122,000	142,000	16.0	55.0	321	...	As rolled.
97,000	136,000	19.0	60.0	321	...	As rolled.
High-Carbon High-Chrome Steel						
43,200	92,450	32.0	64.0	170	...	Annealed.
Low-Carbon Chrome-Vanadium Steel						
194,000	209,000	12.0	51.0	444	200	Heated to 850° C. Cooled very slowly to 800° C., que'h'd in water. Reheated to 850° C. for 20 min., and cooled in air.
197,000	206,000	11.1	53.0	444	260	
182,000	198,000	10.0	53.0	444	320	
166,000	179,000	13.0	57.0	402	375	
161,000	169,000	15.0	58.0	387	430	
146,000	157,000	16.0	59.0	364	485	
144,000	155,000	18.0	60.0	340	540	
130,000	142,000	20.0	68.0	332	595	
158,000	162,000	14.0	57.0	364	430	Heated to 850° C. Cooled very slowly to 800° C., que'h'd in water. Reheated to 850° C. for 20 min., and cooled in air.
142,000	150,000	15.0	61.0	340	485	
135,000	146,000	16.0	62.0	321	540	
128,000	139,000	19.0	64.0	302	605	

A single quenching and drawing treatment, as we have seen from the tests, is sufficient for general purposes to effect complete refinement and hardening of chrome-vanadium steel. This characteristic of simplicity in treatment obviously insures a high-grade product under ordinary commercial conditions, and when compared with the double and triple heat treatments required for the refinement of other alloy steels, the economy presented is obvious. These properties, possessed only by the chrome-vanadium alloy, characterize this steel as a material universally applicable for any commercial requirement. They also simplify the treating instructions necessary to successfully handle alloy steel of this chemical composition. One heat-treating specification is adaptable for any carbon analysis, whether the steel is destined for case-hardening purposes or for oil-treating for gears and cones, etc. It has been found by experience that a temperature of 775 deg. C., which is suitable for hardening a case-hardening steel and still retain desirable toughness of the core, can also be employed for hardening oil-treated parts.

The lower-carbon chrome-vanadium steels are apparently pearlitic in nature and, as such, possess the increased strength and hardness resulting from the effect of the special elements, in producing a ferrite of superior strength, subsequently resulting in a more dense and improved pearlite. With the increase in the carbon and alloy contents, this steel becomes more or less cementitic, and it is probably this quality which demands the use of higher temperatures than usual in treatment in order to produce complete absorption of its component parts.

The quality of chrome-vanadium steel often described as "tough-hardness," is one of its especially desirable properties, and is due probably to the somewhat finer and denser structure of the microscopic constituents, and to their more uniform distribution. This effect is obtained not only through the actual influence of the chromium and vanadium as component parts of the alloy, but also to the influence of the combination of both of these elements in producing in the molten metal a condition of purity and freedom from gases, and, therefore, subsequently forming a metal which, at the time when the structural changes occur, is in the best possible condition for these changes to take place, that is, in the highest form in which the alloy composition renders it possible.

Adaptability of Chrome-Vanadium Steel

From conclusive tests, chrome-vanadium steel can be described as a universal steel. With the carbon present in variable amounts, almost any physical property desired can be secured. It is adaptable for casehardening where the carbon should not exceed 0.20 per cent, that is, for axle shafts, etc., where nominal strength is essential; for oil-treated gears and vanadium springs, where great resilience and resistance to repeated shock is required; for dies, where surface hardness and toughness must both be present; for drills, etc., where wear-resisting qualities and lack of potential brittleness is necessary; for cones and raceways of bearings, which must possess a glass-hard surface, accompanied with proportionate toughness to prevent checking and cracking under the stresses imposed.

The adaptability of chrome-vanadium steel is general, and where strength and hardness and resistance to fatigue properties are the prerequisite, there is a chrome-vanadium steel for the purpose. When the steel is case-hardened, a glass-hard surface and tough fibrous core is easily obtained. These properties are obtained without complex treatment, consisting of simple quenching, with reheating and quenching. For other heat-treated parts, a simple heating, quenching and drawing give a steel, relatively so tough and strong that it is unlike any other hardening alloy steel. Chrome-vanadium steel is a universal alloy steel and stands forth unmistakably as the master alloy.

TABLE 2.—RESULTS OF TESTS ON CHROME-VANADIUM STEELS BY A LARGE AUTOMOBILE MAKER

Specimen No.	Elastic Limit, lb. per sq. in.	Tensile Strength lb. per sq. in.	Elongation in 2 in. Per Cent.	Reduction of Area Per Cent.	Brinell Hardness No.
1	162820	172850	14	49.7	418
2	160130	172090	14	49.5	418
3	160840	173090	15	49.9	387
4	159520	171630	14.5	46.9	375
5	154480	164760	14	52.4	364
6	151000	162210	14	55.7	364
7	154570	165160	15	52.3	364
8	153920	163590	15	54.0	351
9	146590	162790	15	55.6	340
10	146700	156360	15	55.7	340
11	146080	157790	15.5	55.3	321
12	148620	158090	15.5	55.8	332

Table 2 gives results of tests made by a large automobile manufacturer using chrome-vanadium steel for principal parts. The tests given represent those made from 0.30 to 0.40 per cent. carbon chrome-vanadium steel used for axle shafts, and demonstrate results that are secured from routine practice. The uniform strength exhibited supplies incontestable testimony of the dependable qualities inherent in this analysis steel when treated in commercial quantites.

TO USE BITUMINOUS COAL MORE EFFICIENTLY

AT the present moment, when the fuel situation forces itself upon the attention of every householder in the country, any discussion of the coal problem that goes into the causes at the bottom of the present unstable and unsatisfactory state of affairs should receive a careful and serious hearing. Especially so if at the same time this discussion is constructive and points the way to a rational development of the vast coal resources of the nation so that they will not only meet adequately the demands of a growing industrial development but also will be firm and strong enough to stand the shock of untoward events. It is evident that their present development fails now the test of world emergency.

Such a discussion is to be found in a short bulletin by Chester G. Gilbert, entitled "Coal Products: An Object Lesson in Resource Administration," just published by the United States National Museum, and constituting the third paper of the series, "The Mineral Industries of the United States," in course of issue by the division of mineral technology of this institution.

American "Lack of Analysis."

The author at the outset points out the magnitude of the coal resources of the United States and the utter dependency of national welfare upon their proper development. Yet with more coal than is found in any other country, or indeed on any other continent, this country has long been dependent upon foreign sources for such essential products made from coal as dyestuffs, fixed nitrogen, and many important drugs; and is to-day, with the first pinch of war stress, uncertain whether the fuel needs of the American home can be met even during the coming months. With characteristic lack of analysis, the American public has never faced these shortages in phases of a single problem, but has first become alarmed at the dye shortage, then excited over the nitrogen dearth, and is now shivering in anticipation of a meagre fuel supply.

Output Inadequately Used

To explain the present coal shortage by transportation congestion or labor difficulties is to offer a superficial cause. These dilemmas, of course, are the concrete means through which the trouble makes itself felt, but back of them stretches a far-reaching failure to work out a proper development for America's greatest resource. The trouble is not that insufficient coal is mined and transported but that the present output is inadequately used—its full commodity value is not obtained. In general, our coal could be made to go a third further in meeting the nation's needs.

The domestic fuel stringency is only one angle of the coal problem, but a very distressing angle for the average person. The trouble here is the fact that the demand put upon anthracite, or hard coal, which is practically limited in occurrence to a few counties in Pennsylvania, is out of all proportion to the size of the deposits. The homes of the country must begin to turn aside from the luxurious and costly anthracite and look more to our vast bituminous resources, which are widely distributed, favorably situated, and can not so readily be tied up by concerted strikes or so easily held down by traffic congestion. But bituminous coal is dirty; and its widespread utilization as such would be a long step backward, retarding progress in civic betterment as well as involving a 30 per cent. waste in commodity bulk.

Saving by Proper Usage

This waste, however, which appears in the guise of smoke, is in reality convertible into gas, tar, ammonia, benzol, and an endless number of other by-products, such as dyes, medicines, and explosives. It is therefore possible by proper shaping of economic policy to remove the disproportionable drain on the limited supply of anthracite, to turn the wasted third part of bituminous coal into useful products, to eliminate smoke from our cities, and to so distribute the sources of domestic fuel supply as to alleviate, if not entirely solve, the labor and transportation perplexities of the present situation.

These desirable results are already in course of natural development, but progress is disastrously slow, impeded as it is by lack of proper stimulus and excess of misdirected pressure. The advance so far has been solely in the metallurgical field. For converting iron ores into metallic iron, a substance known as coke is needed. This is made artificially from coal by driving off its volatile portion, its smoke, so to speak. Almost a seventh of our coal is made into coke, so great are the demands of the iron industry, but two-thirds of this coke is produced without regard to saving the valuable products driven off during its manufacture. Therefore we face the alarming conclusion that only about 4 per cent of the coal mined in the United States yields its full value to society.

More Coke Needed

Progress in coal utilization depends fundamentally upon the production of more coke. At present the situation is limited by the needs of the iron industry. The quantity and type of coke thus far produced has been determined by its metallurgical use. Sporadic attempts to apply metallurgical coke to household purposes have met with failure and placed coke in an unfavorable light. Coke must be made of such kind as to be suitable for domestic use. This can be done; and the accomplishment is an urgent necessity. Domestic coke, in reality, will be artificial anthracite.

There is room in our industrial system for a greatly changed utilization of coal; in short, for coal to be used in the form of anthracite, artificial anthracite (domestic coke and steam-engine coke), metallurgical coke, gas for illuminating and power purposes, benzol for automobile engines, and at the same time made to yield a sufficiency of nitrogen, dyestuffs, explosives, and other coal-product chemicals. There is present need for all these products. The problem is to make the necessary readjustments.

The solution of the whole coal problem, in short, does not consist in cutting down industrial activities to meet present coal output, nor in circumscribing the scale of economic life to fit present misdirection of coal resources, but lies in working toward an industrial situation that will both permit and demand a widespread treatment of bituminous coal so as to yield on the one hand a smokeless fuel, an artificial anthracite so to speak, suitable alike for the home and the factory; and on the other a host of by-products essential to the industries of the nation.

FRENCH DISCOVER NEW LIGHT WEIGHT METAL

IT is said that the French government is manufacturing helmets from an alloy discovered by a Mr. De Montby, which contains from 92 to 97 per cent. of aluminum. It is suitable for use in the manufacture of air craft and military equipment. According to "Engineering," it is silver-white, has a specific gravity of 2.82, and a melting point of 1,382 deg. Fahr. Its tensile strength in castings is given as 30,000 lb. per square inch, and in rods and sheets up to 64,000 lbs.; heat treated, its tensile strength is given as over 70,000 lb. per square inch. It is claimed that it may be sand cast, die cast with or without pressure, hot and cold forged, annealed, drawn, rolled, stamped, hardened by temper, polished, electroplated, and soldered. It withstands the action of all acids except hydrochloric.

APPLICATION OF SHELL DISCARD STEEL

VARIOUS reports indicate a broader use of shell discard steel in rolling and manufacturing operations. It is believed that picks, crow-bars and digging bars are now being made largely from shell discard steel, while as already reported this steel, in the form of 1½-inch square billets, has become the regular material for stirring rods. No precise information is available as to the proportion of shell discard steel that is being used by the steel works for rolling light rails, but the common view is that this is now the chief material.

This steel is in general quite akin to rail steel in character. The carbon averages somewhat lower, in general, but as the manganese is higher the material is fully as hard as rail steel. The phosphorus and sulphur are somewhat better.

Recent Advances in Canadian Metallurgy*

By Alfred Stansfield, D.Sc., F.R.S.C. **

The mineral resources of Canada have been of immense value to the Allies—nickel alone being of vital importance. The developments induced by war's demands have demonstrated convincingly the variety and extent of the various metals, both rare and semi-rare, and the facilities for production so brought about are expected to maintain the Dominion in its present position of world-wide importance.

IN writing of "recent" advances, it becomes necessary to decide on some definite period of time on which to report, and this surprising war has given such an impetus to Canadian metallurgy that it will be appropriate to regard the commencement of the war as the epoch from which to measure these advances.

Metal Markets in War Time

The first effect of the war was to restrict the regular operation of metallurgical plants and to stop al lnew developments. This followed naturally from uncertainty in the financial situation and an immediate lack of money. Looking back at the situation it seems strange that markets should fall, and metal production decrease, when it must have been certain that nearly all the metals would be needed in increasing quantities for warlike operations. After about six months this demand became apparent, the prices of metals began to rise, and their production was consequently stimulated. An early development was caused by the shell committee's need of brass for cartridge cases. Copper for this purpose could be obtained without great difficulty, but zinc, of a suitable degree of purity, was very difficult to obtain even at a greatly enhanced price. Zinc ores had been mined in British Columbia for a number of years, but it had not been found practicable to smelt them in this country, and zinc ores, or concentrates, were shipped to smelters in the American zinc districts. After the outbreak of the war, the American smelters refused to accept ore shipments from Canada; a refusal which was considered by many as being caused by German control or interest in the smelters. Whatever was the cause the situation was clear: the shell committee needed zinc, and the British Columbia miners had the ore, while the American smelters were unwilling or unable to convert the one into the other.

Zinc Production

Zinc differs from many metals in the fact that the smelting process yields a metal which is marketable without the need of any refining. The purity of the "spelter" depends mostly upon the character of the ore from which it is produced, thus "high-grade" spelter, from specially pure ores will contain less than 0.1 per cent. of total impurity, while "Prime Western" spelter, obtained from leady ores, may contain as much as 1.5 per cent. of lead. This difference in the purity of different brands of spelter is not objectionable, since the uses to which they are put vary greatly in requirements; prime Western spelter is amply good enough for galvanizing, while high-grade spelter is none too good for making brass for cartridge cases. The British Columbia zinc ores are in general mixed with ores of lead. and it would be impossible by the usual smelting process to obtain a spelter that would meet the requirements of the shell committee.

A process was under investigation, at that time, for obtaining zinc from these complex ores by roasting, extracting the zinc as sulphate by means of sulphuric acid and water, and separating metallic zinc from this solution by electrolysis, using insoluble anodes. This process was not new, but it had failed hitherto owing to technical difficulties in the leaching of the ore, the purification of the solution and the production by electrolysis of compact zinc that could be remelted. The cost, moreover, was too high to make it profitable in view of the low price of zinc before the war. A commission was appointed by the Minister of Militia to investigate the situation with respect to the supplies of copper and zinc. This commission concluded that the electrolytic process offered the greatest probability of filling the need, and made arrangements with the Consolidated Mining and Smelting Company, which led to the establishment at Trail of a plant for producing electrolytic zinc from the British Columbia ores. At the present time this plant has a capacity of about 300 tons of zinc per week.

Before the war the writer carried out an elaborate investigation for the Department of Mines on the electric smelting of zinc ores, but practical success was not reached. During the war this research has been taken up again for a mining company with more success, both in the laboratory and in a small plant at Shawinigan Falls. Commercial success has not yet been obtained, but it is expected that the work will be resumed during the present year. The writer has also been interested in the production of zinc oxide for paint by the Wetherill process; he helped to design and operate an experimental plant in Montreal, and following on from this, a full-sized plant has been erected at Notre Dame des Anges.

The metallurgy of zinc, as well as that of lead, copper and silver, has been materially improved during recent years by the application of the flotation process by means of which the zinc minerals can be separated more perfectly from the gangue, and in some cases from other metallic minerals.

Copper Situation

The copper situation, investigated by the commission, was entirely different; copper ores are mined and smelted in British Columbia on an enormous scale for the production of copper matte, and in some cases the matte is bessemerized for the production of metallic copper. Crude copper, however, is of no use until it has been refined, and all the copper derived from British Columbia was sent to the United States as ore, matte, or blister copper, in order to be refined in the American refineries.

The problem before the commission was the establishment in Canada of an electrolytic refinery, so that Canadian copper could be made available for Canadian needs of that metal. The problem was complicated by American interests in the Canadian copper smelters, by contracts with American smelters and refiners, by heavy freight charges between British Columbia and the points at which the copper would be used, and by the lack in Canada of rolling mills and other works for turning the refined copper into sheets, rods, wires and other forms required by the Canadian market. Although the price of copper rose to a very high figure, the shell committee was able to obtain supplies of pure copper from the States, and there was not sufficient urgency to justify the Government in establishing a copper refinery in British Columbia in face of the natural obstacles already mentioned.

In the meantime the Consolidated Mining and Smelting Company established at Trail a small refinery, which is now in operation, and has an output of about 10 tons per day, and the copper and zinc from Trail have both been used in the Dominion Copper Products' plant in Montreal for making brass for the manufacture of cartridge cases. It must not be supposed that the erection of this small refinery solves the general problem outlined above, although it may serve by way of example to help in settling it at some later date. The copper furnaces at Trail smelt ores of gold and silver as well as ores of copper, and the resulting crude copper is so rich in the precious metals that the company finds it more satisfactory to refine the metal at Trail, thus securing the gold and silver contents, instead of shipping the crude metal to distant refineries which would entail very serious difficulties in ascertaining and obtaining credit for the gold and silver that is alloyed with the copper. For economical operation, a copper refinery should have a very large output, say 100 tons a day.

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*Read before the Canadian Society of Civil Engineers at Montreal, Feb. 14, 1918.

**Birks Professor of Metallurgy, McGill University.

The whole output of copper from British Columbia amounted in 1913 to about 23,000 tons, or about 60 tons per day, so that a practically unanimous co-operation of all the producing companies would be needed to support a single refinery. We may hope that, in course of time, a large refinery will be operated in British Columbia for the treatment of Western ores, but this will depend on the erection in that province of mills for working up the refined copper, and of the growth of a market in Western Canada that will absorb a large part of the output of such a refinery.

The production of copper in British Columbia has increased steadily during recent years as the following figures show, this increase being largely due to the development of the Granby Company's smelter at Anyox. Recently the copper smelter at Ladysmith has changed hands and has again been put into operation. This increase of copper production will tend towards the establishment of a large refinery on the coast. The introduction of the flotation process has modified copper metallurgy in recent years. Low grade ores, which were at one time smelted in blast furnaces, or even treated by wet (chemical) methods, are now crushed and ground to a fine powder and concentrated by flotation. The flotation concentrate, on account of its powdery condition, can be treated most easily by roasting in mechanical furnaces and smelting in reverberatory furnaces.

PRODUCTION OF COPPER IN BRITISH COLUMBIA IN TONS

1913	1914	1915	1916
23,000	21,000	28,000	32,000

Outside of British Columbia, the largest production of Canadian copper is from the Sudbury district, where it occurs in association with nickel. The production in Ontario, nearly all being from the Sudbury district, is about half the production in British Columbia, but its separation and refining is dependent on the separation of the nickel and copper, and can only be considered as a by-product from the extraction of nickel.

Nickel Production and Refining

At the beginning of the war, two companies,—the International Nickel Company and the Mond Nickel Company,—were operating in the Sudbury district. These companies smelted the ore to a matte containing from 20 per cent. to 30 per cent. of nickel and copper, and then bessemerized this to obtain a matte of about 80 per cent. of nickel and copper, containing little else than sulphide of nickel and sulphide of copper in proportions depending on the relation between these metals in the original ore. The Mond Company shipped their matte to England for treatment by the Mond process at their works at Clydach, in South Wales, while the International Company treated their matte by the "salt cake" process at their refinery at Constable Hook in New Jersey.

It has for a long time been regarded as an economic injustice to Canada that the copper-nickel matte should be sent to the States for refining, but it was maintained by the company officials that the cost of refining it in Canada would be very much higher than in New Jersey. After the outbreak of the war, attention was repeatedly called to the situation, because it was feared that the nickel passed into German hands, and as a result of this outcry the International Company agreed to erect in Canada a refinery sufficiently large for the British requirements of nickel. This refinery is now being built at Port Colborne, in Ontario, and should be in operation early in the present year; it will have an initial output of 7,500 tons of nickel per annum. In the meantime a new company has entered the field.

The British America Nickel Corporation, a strong British-Canadian company, which is controlled by the Imperial Government, has acquired about 17,000 acres of mineral land in the Sudbury district, and early in 1917 began the construction of a large smelting and refining works at the Murray mine. This company will smelt the ore to matte, and bessemerize the matte on substantially the same lines as the older companies; but the production of refined nickel and copper from the matte will be carried out by the Hybinette electrolytic process, which is now in operation in Norway. The new plant is expected to be in operation in 1919, and will have an output of 6,000 tons of refined nickel per annum. In 1913, the last whole year before the war, nickel matte, containing 25,000 tons of nickel was sent abroad to be refined; during 1917 the output was about 42,000 tons, and by 1919 we may expect a production of some 13,000 tons of nickel in Canada in addition to perhaps three times this amount in matte refined abroad.

During the year 1914 one million tons of nickel-copper ore was mined and smelted in the Sudbury district, and the resulting matte contained 22,700 tons of nickel and 14,000 tons of copper. Some 400,000 tons of iron, equal to half the Canadian production of pig iron, was slagged in the furnaces and thrown over the dumps, and 300,000 tons of sulphur was discharged into the atmosphere. This sulphur would produce one million tons of sulphuric acid, which is equal to one-fourth of the consumption of the United States, but it is not considered worth while to save this at the present time on account of the cost of transportation of the acid to points at which it could be used. Projects have been considered, however, for saving the sulphur in the elemental state so that it could be shipped easily, or for collecting the SO_2 gas in the liquid state and using it for the manufacture of wood pulp. With regard to the waste of iron, it may be remembered that more than half the nickel produced is used in the manufacture of nickel steel, and with respect to this part of the output, there is therefore no need to separate from the nickel the iron which was originally associated with it.

Attempts to make a nickel pig-iron which could be converted directly into nickel steel were met in the past by the difficulty that the copper, which is almost always present in the ore, was supposed to be harmful in the steel. During recent years, however, it has been found that if the copper is present in moderate amounts, not more than one third of the nickel contents, a nickel-copper steel is entirely satisfactory and may be expected to replace the usual nickel steel for many purposes. Many tons of this steel have recently been made from the Sudbury ore, by the process devised by Mr. Colvocoresses; and its mechanical properties and suitability for many purposes will soon be ascertained. It should be possible to employ this process on a large scale, although, of course, it is limited to ores with a small content of copper. Care will be taken, by suitable admixture of the ores and otherwise, to maintain a uniform product, and it may be added that the small amount of precious metals contained in the ore cannot be saved if this process is used.

In connection with the advances in the nickel industry, mention must be made of the investigation of the Ontario Nickel Commission, which was appointed in 1915 and brought out its report in 1917. This commission has investigated the ores, smelting processes, refining methods, properties and uses of nickel, not only in Canada, but in all parts of the world where nickel ores are mined. They have considered the subject from many points of view, and have produced a very valuable report. Geo. T. Holloway, the metallurgist of the commission, died soon after the completion of his work.

The production of iron and steel in Canada fell off considerably at the beginning of the war, but revived later, and at the present time, owing to the large demands for the manufacture of munitions, is larger than ever. This will be seen from the following table:—

PRODUCTION OF IRON AND STEEL IN SHORT TONS[*]

	1912	1913	1914	1915	1916	1917
Canadian iron ore	216.000	307.000	245,000	398,000	340,000	190,000
Pig iron	1,014.000	1,129 000	783,000	914,000	1,169,000	1,187,000
Steel ingots and castings	957,000	1,169,000	828,000	1,020,000	1,454,000	1,735,000
Electric furnace steel			61	5,600	43,000	50,000

Electric Iron Smelting

The production of steel has advanced faster than the production of pig-iron, the latter being restricted by the need of importing the ore, and in some cases even the fuel, for smelting in Canadian furnaces. The amount of ore mined in Canada is but a small proportion of the amount smelted, but if we include Newfoundland ore, as we reasonably may, we would find that rather more than half the iron is derived from Canadian ore.

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[*] The figures for production in this paper have been taken from the reports by John McLeish, who kindly furnished the writer with approximate data for 1917. The amounts, in most cases, have been stated in even thousands, as in this form they are far more easily read and compared.

Just before the war the writer visited Sweden in order to study the electric iron smelting industry in that country, and made a report to the Mines Branch in the fall of 1914. At that time it did not appear that electric iron smelting could be undertaken profitably in this country, but in the year 1916 he made a fresh study of the situation in connection with a report by Mr. John Dresser on "Part of the District of Lake St. John, Quebec," and came to the conclusion that there is hope for electric pig-iron in Canada.

Electric Furnace Steel

Although electric smelting of iron ores is still in the future, the electric furnace has been employed very largely for making steel, as is shown in the table. The electric furnace has not been used in this country to any extent for making new steel, but mostly for remelting steel scrap into shell billets. For this purpose several furnaces are in operation in Montreal and district, and at Toronto a large plant, containing ten 6-ton furnaces has been built by the Munitions Board for remelting shell turnings and other scrap. During the period under consideration the Armstrong Whitworth Company have built up an electric melting plant for the production of all kinds of tool steel in their works at Longueuil. The electric steel plant at Belleville has made a quantity of very good steel from titaniferous iron ore, but at that time it was found cheaper to employ steel scrap than to smelt ore. The plant has recently been fully occupied with the production of ferro molybdenum for the British Government.

Ferro Alloys

There has been, for a number of years, a moderate production of ferro-alloys in Canada amounting in 1913 to 8,000 tons, in 1914 to 7,500 tons, and in 1915 to 10,800 tons. This production consisted mostly of ferro-silicon made in electric furnaces at Welland by the Electro-Metals Limited, and in 1915 a little ferro-phosphorus made at Buckingham, P.Q., by the Electric Reduction Company. In 1916 the production hod risen to 28,600 tons, valued at $1,777,000, and included, besides ferro-silicon and ferro-phosphorus, a considerable production of the valuable product, ferro-molybdenum, which is now made in electric furnaces at Belleville and Orillia. Ferro-silicon is now made at Shawinigan as well as at Welland. For the manufacture of steel there is a considerable demand for ferro-manganese and spiegel-eisen, and experiments are now in progress for making these alloys from Canadian manganese ores. The production of ferro-chrome is also under consideration.

Gold and Silver

More than 80 per cent. of Canadian silver comes from the Cobalt region, and, during the period of the war the production has ben falling slowly as the mines became exhausted, and on account of the scarcity of labor and supplies. The recent rise in price of silver has, however, stimulated the production. The metallurgical treatment of the ores had been worked out prior to the war, but the development of the flotation process has improved the concentration processes at Cobalt.

Lead

The need of lead for bullets caused an increase in the mining and smelting of lead ores, with the result that in 1917, when this demand was reduced, there arose a difficulty in disposing of the lead already on hand and undergoing treatment. The management of the Trail Smelter informed the miners that they would only take ores that were relatively free from zinc, so as to reduce the ore supply, and at the same time obtain a better grade of ore. This ruling gave rise to a great outcry, and arrangements were made with the Munitions Board to take a larger amount of the metal.

The success of the Victory Loan should enable the production to be taken up by the Board, but it may be pointed out that the normal Canadian market for lead and lead products is amply sufficient for the Canadian production, and it is only necessary to arrange for the lead being converted into marketable forms. Some advance has been made in this direction, and there are two "corroding" plants in Montreal for the production of white lead, but red lead and litharge should also be manufactured. The usual production of lead is about 20,000 tons per annum, but in 1917 it amounted to 28,000 tons. The Cottrell electrical precipitation process for the collection of smoke and fume has proved of great service in the treatment of ores of lead and zinc, and has been introduced at the Trail smelter.

Antimony

The metal antimony was selling at about 8 cents per pound, but early in the war its price rose to 16 cents, and later to more than 40 cents a pound. Antimony is used to a large extent alloyed with lead for making shrapnel bullets, and supply was for a time insufficient for the need, so that bullets have been made of lead encased in a steel shell, the whole being arranged to have the same size and weight as the bullets of alloy previously in use.

Antimony is not produced to any extent in Canada although a small amount is derived from the electrolytic refining of lead at Trail. In view of the high price and unusual demand for the metal a mine of low grade ore at Lake George, New Brunswick, was reopened and after much patient work an efficient process was devised for extracting the metal from the ore by volatilization. An account of this process was recently presented to the Society by Mr. J. A. deCew. By the time that the process had been brought to a satisfactory condition, other suplies of antimony became available, the price fell, and the mine and smelter had to be closed.

Aluminum and Magnesium

The process of extracting aluminum from alumina (purified bauxite) consists, as is well known, in electrolysing fused salts to which alumina is added. Before the war this was the only operation in use in Canada, that depended on the electrolysis of fused salts, but a fresh industry of this kind has been now started—the production of the metal magnesium. Before the war this metal was made in Germany from the natural deposits of carnallite, but the war stopped this source of supply.

The writer succeeded in producing magnesium in the laboratory, and the process was developed into commercial operation at Shawinigan Falls. At present the crude materials are imported, but ultimately it is intended to use Canadian magnesite as the ore of this metal. Magnesium is now made in considerable quantities at this plant; it is used in the form of powder for star shells and alloyed with aluminum for the construction of aeroplanes. It is also used as a deoxidizing addition in melting certain metals and alloys.

Cobalt

The metal cobalt, which gave its name to the largest silver producing district in Canada, has not as yet found very many uses. It can be employed like nickel for plating, but being more costly its use is limited. It has also been employed in steel making. Valuable researches in regard to its use have been made by Professor Kalmus at Queen's University. A recent development is its use in the production of "Stellite," an alloy of cobalt, chromium and tungsten which is used for cutting tools in place of high speed steel.

Brass Melting and Rolling

In connection with the production of zinc and the refining of copper in Canada the need arises for converting these and other metals into marketable forms. The Dominion Copper Products plant at Lachine has been built during the war for melting and rolling brass and copper for use in shell and cartridge cases. As the need for such products decreases, it is expected that this plant and Brown's Copper and Brass Rolling Mills in Toronto will be employed on a large scale for making brass and other non-ferrous alloys and for rolling these and the metals copper and zinc into forms suitable for use by Canadian manufacturing industries, so that a market will be found in Canada for Canadian copper, zinc, nickel, lead and other metals.

Developing a Self-Served Lunch System

By Gustave Keuchenmeister *

The welfare of the employee is being considered by the progressive manufacturer to an extent unheard of a few years ago. It is a recognized fact that anything promoting the welfare and happiness of the employee is not only a credit to the manufacturer on humanitarian grounds but has a direct monetary and commercial value to employer and employee.

THE steadily-increasing cost of food is felt as quickly by the workman as any other class. It becomes quite a problem for wage earners to meet expenses with prices constantly rising. Payments on homes, rent, and other fixed expenses must be met, so usually the first place retrenchment commences is on food, which often results in serious trouble. A well fed, well nourished man is better natured and more efficient than the man with an empty stomach, or, what may be worse, a stomach filled with poor food.

The problem of arranging a satisfactory lunch-time service at the plant of the Dominion Forge and Stamping Co., Windsor, became quite serious, as there were no restaurants or lunch rooms nearby for some time. A lunch room was finally opened next door, but the proprietor, however, soon realized that in order to hold the price down to match a workman's pocket book, both quantity and quality had to be sacrificed, with the result that the lunches were edible and that was all.

Taking these things into consideration, and looking to the welfare of the employees, a lunch room was provided for, when the plans for rebuilding the plant were drawn.

Tentative Arrangement

At first a small equipment—enough to serve tea, coffee, and milk, to the office force of about twenty men—was installed and experimented with. Sandwiches and pastry were bought ready to serve. Each day the order was telephoned to a bakery, and it was sent up in separate packages; also, any man could bring his own lunch and buy coffee, tea, or milk in the kitchen if he so desired. This worked out fairly well, except that almost every day some man found that he had not ordered enough and promptly began begging from his neighbors.

DINING ROOM FOR OFFICE STAFF.

The experiment soon showed that the plan for a large equipment was feasible, and as the shop men pleaded to be served, a restaurant outfit was purchased. The kitchen as it now stands is equipped with the following:

One 10-gallon coffee urn.
One sideboard for dishes.
One refrigerator (white enamel lined).
One counter.
One counter truck.
One gas plate.
Two dozen white cups and saucers, plates, spoons, knives and forks.
100 1-pint white enamelware cups
100 black enamel trays (8 in. x 14 ins.)
Miscellaneous kitchen utensils, etc.

SHOP MEN AT TABLES ON THIRD FLOOR.

The lunch room for the office adjoins the kitchen, and the serve-self plan is carried out. The men of plant No. 1 are served from the counter truck ("a la cart," as one man jokingly remarked), which is loaded, put onto the elevator, and raised to the third floor. The men at plant No. 3, about a block away are served by carrying a large can of coffee and baskets of sandwiches, pie, and buns, to the plant.

The first week the shop men were served on the lower floor and they ate their lunches at their benches or any place they chose. One of the foremen, however, suggested placing tables in a vacant space on the third floor, and the suggestion was quickly acted upon, and found to be more satisfactory. Smoking is permitted during the lunch period on this floor only, and it brings the men together in a sociable way as well as providing a suitable place to eat.

Typical Menu

No complaints about the quality or quantity of the food have been heard. A typical lunch consists of:

Coffee, about two-thirds of a pint	.03
2 sandwiches, ham, tongue, or salmon	.08
Pie, mince, raisin, or apple (cut in quarters) per cut	.04
Jelly bar, doughnut with jelly inside	.02
1 sweet roll, various kinds	.02
Total	.19

---

*Superintendent Safety and Welfare Department, Dominion Forge & Stamping Co., Walkerville, Ont.

Most of the men have quit carrying lunches, saying it is cheaper to buy them at the shop, and far more pleasing to their wives. A small supply of tobacco, cigars, gloves, gum, and hand soap, is kept in store for the convenience of the men, and greatly appreciated.

COUNTER TRUCK LOADED, READY TO PUT ON ELEVATOR.

By close buying, and watchfulness on the part of the cateress to prevent waste, the lunch room is self-sustaining, and consequently a successful venture, although not intended as a profit-paying investment.

WATERS AND WATER-POWERS

THE ninth annual report of the commission of conservation contains extended references by the chairman, Sir Clifford Sifton, to numerous phases of conservation throughout 1917. Speaking of electric power plants he states that the preliminary survey of the water-powers of Canada is now practically completed. During the past year special efforts have been made to secure detailed information with regard to electric power plants and systems throughout the Dominion.

Power Progress in Ontario

The development of hydro-electric power in Canada, and especially in the provinces of Ontario and Quebec, during the last ten years has been almost incredible. At the beginning of the work of the Ontario Hydro-Electric Power Commission, the late premier, Sir James Whitney, stated that the Commission would not require so much as 10,000 h.p. At this moment, the immediate requirements of the Hydro-Electric Power Commission in Ontario may be conservatively stated at 296,000 h.p., upon which demand there is a present shortage of about 70,000 h.p. A conservative estimate of the amount of power actually in use in the city of Montreal and its environs is 225,000 h.p. The position with respect to the province of Ontario, and especially with regard to Niagara Falls, is one which should be considered with great care. At the present time, the Hydro-Electric Power Commission is about 70,000 h.p. short, and it is not too much to say that this shortage will rapidly increase. I understand that Sir Henry Drayton has reported to the Federal Government that it is not practicable to withdraw this 70,000 h.p., which is presently in demand, from the United States to which it is now being exported, for the reason that the power is necessary for the use of plants which are producing essential war material for Great Britain and her allies. The position is, therefore, that, whereas, 12 or 15 years ago, it was not thought that the Hydro-Electric Power Commission could make use of 10,000 h.p., and, accordingly permits to export were more or less freely given, there is now, in round figures, an immediate demand for 300,000 h.p., and the demand cannot be satisfied.

St. Lawrence Power Situation

A situation analagous to that in which Niagara power stood fifteen years ago now exists on the St. Lawrence river. A very large capacity for the development of power exists upon the St. Lawrence. There is a considerable development in the neighborhood of Montreal, but the greater portion of the power still remains undeveloped. Attempts are constantly being made to fataly complicate the position with respect to St. Lawrence power by securing the privilege of private development, which will be followed by contracts for the exportation of the power developed. I understand that the Cedars Rapids company exports something like 60,000 h.p. per annum. An attempt was made some years ago to secure the privilege of developing the Long Sault power, the purpose being to export the greater portion of the power in the interest of a manufacturing corporation on the United States side of the line. This project was defeated, largely through our efforts. A similar project is now being promoted, and we are resisting it with all our energy and we trust with fair prospects of success. It is almost incredible that any responsible man should be so short-sighted as to favor this project in the face of the experience which we are now undergoing at Niagara.

International Development Proposed

Within a very few years, there will be a demand for every horse-power that can be developed on the St. Lawrence river to which Canada is entitled for use upon the Canadian side. The situation with regard to Niagara will undoubtedly be duplicated, and if we are foolish enough to allow vested interests to be created upon the other side of the line, we shall inevitably find ourselves handicapped and embarrassed as we now are with respect to Niagara power. For myself, I have no doubt at all what ought to be done with respect to the great powers dormant in the St. Lawrence river. The United States Government is not interested in the corporations that are endeavoring to get possession of the St. Lawrence powers from the other side. Neither is the Canadian Government interested in the fortunes of the gentlemen who are promoting their projects on the Canadian side. They are very few in number, and their interests are confined entirely to themselves. What the United States Government and the Canadian Government alike are interested in is that there should be a fair division of this power, that it should be developed in such a way that the neighboring and tributary population should have the use of it upon fair terms.

PART OF KITCHEN, COUNTER AND COUNTER TRUCK.

WOOD MILLING MACHINE FOR THE PATTERN SHOP

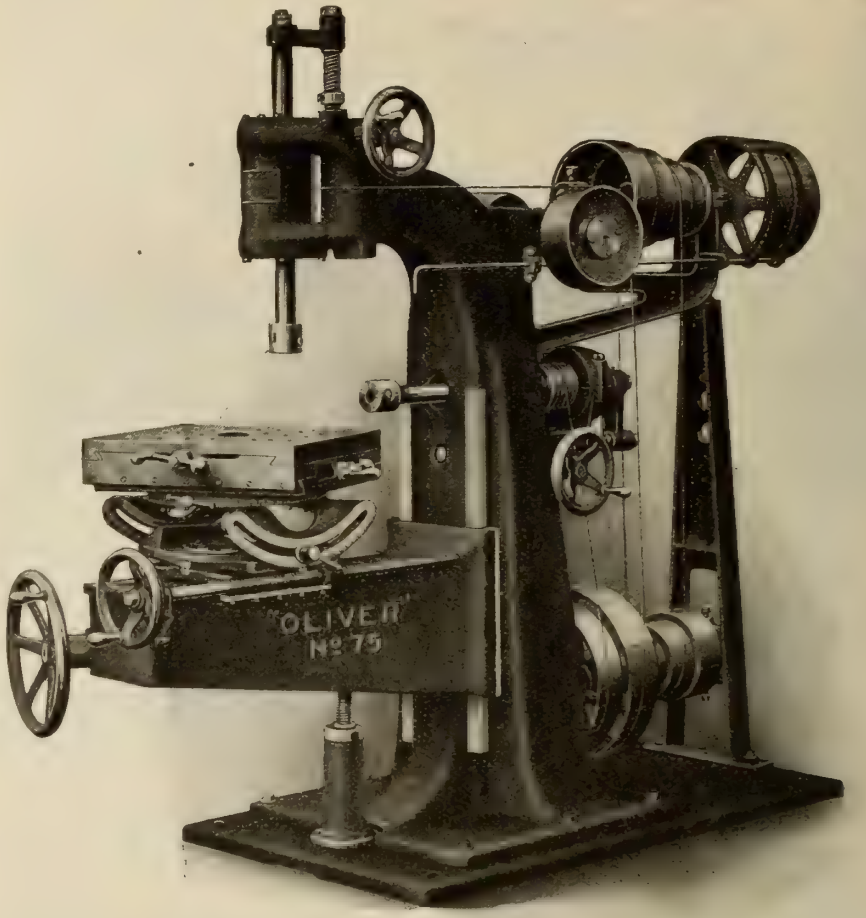
THE machine illustrated in the accompanying engravings has been developed by the Oliver Machinery Co. of Grand Rapids, Mich., to eliminate much of the tedious pattern shop work formerly done by hand, and it is capable of as wide a range of operations as the milling machine forming a part of every tool room.

By the use of a similar dividing head gear teeth may be cut and work accurately indexed in any desired manner. Core boxes of any section may be routed out.

The table is 20 ins. square and is divided accurately in 1 in. squares by etched lines and tapped at convenient locations for attaching general purpose clamps. A 3-in. removable centering disk permits boring below the line of table without injury to boring tools. For circular work where the work revolves two centering plugs ½ in. and 1 in. diameter respectively are furnished. The table swivels on ball bearings, full 360 degrees and at 90 degree points a positive lock operates to locate these important table positions correctly. The table tilts 45 degrees in either direction and cross-feed of table is secured by screw and ball crank lever, which may be operated from either side of table. A positive centering device locates center directly over the ball-bearing swivel center for circular work. The cross feed travel is 12 inches.

The spindles are made from high-grade high carbon stock and are accurately ground. The spindle diameter is 1⅞ ins. in sleeve with a 3 in. head for receiving cutters with No. 4 Morse taper. Both the vertical and horizontal spindles are hollow to allow the draw in rods to safely hold the fly cutter holders in place. The vertical travel of spindle is 10 in., while the horizontal spindle has 11½ in. travel. Both spindles are controlled by handwheel and spiral gear acting on a double square thread screw of large diameter. A micrometer adjustment to both handwheels permits of very accurate control of the cutting tool. Each spindle control screw is provided with a knurled brass positive stop lock nut to insure cutting to given depth. The spindles slide easily in accurately bored pulley sleeves, the construction of which is such that no belt strain whatever is transmitted to the spindle. Distance of center of vertical spindle to the face of column is 18 in., and when in the highest position it is 24 ins. above the table. Center line of horizontal spindle is 14 ins. above table at the lowest position.

VIEW OF TABLE SHOWING COMPOUND CROSS SLIDES, DOUBLE SWIVEL AND METHOD OF TILTING



WOOD MILLING MACHINE. VIEW SHOWING FOUR-SPEED COUNTERSHAFT BELT DRIVE.

Bearings

Both the vertical and horizontal spindles run on ball bearings of large diameter, allowing a maximum speed of 5,000 R. P. M. if desirable on certain work. The regular speeds of each spindle are 1,250, 2,000, 3,000 and 4,300 revs. per min. Idler pulleys are 10 in. diameter and 4 in. face, and are provided with ball bearings, thus eliminating all lubrication troubles of high speed loose pulleys. The countershaft bearings are of genuine babbitt as the slower speeds render ball bearings needless, and the loose driving pulley has a die cast white bronze bushing.

A box type knee is provided, closed on top to prevent chips interfering with the raising mechanism. Horizontal planed ways permit the table to travel to and from column a distance of 17 ins., a large square thread screw and handwheel giving rapid traverse. Additional support to the knee is rendered by a centrally located telescoping screw. An extra large handwheel operating this screw lowers and raises the knee for its 21 in. of vertical travel.

By using the vertical spindle work up to 19 ins. diameter may be turned by means of the revolving table. By centering the work on the table center plugs, work up to 28 ins. diameter may be turned by revolving work on table. By using horizontal spindle and revolving table, work up to 48 ins. diameter may be turned.

For bevel gear patterns the horizontal spindle is used and the dividing head is tilted to suit. Two cutters are used, one for the correct shape at the front and one for the correct shape at the smaller end or back.

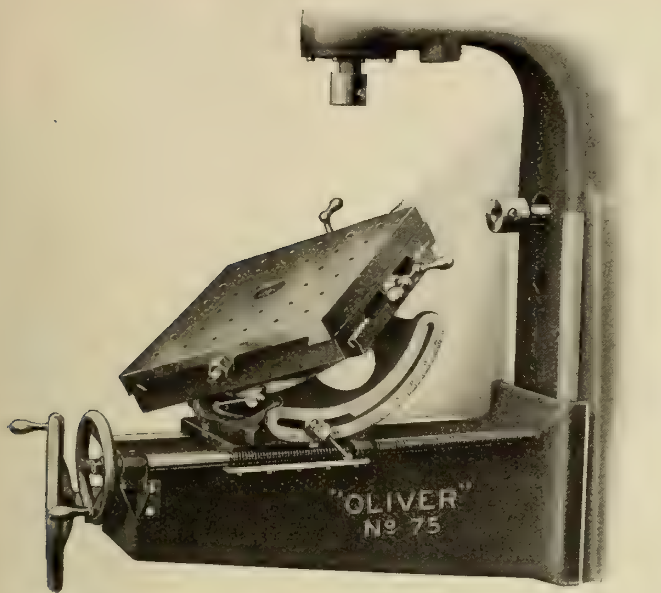
For spur gears one cutter only is necessary and no hand work is needed.

The machine may also be used upon soft white metal patterns in which case slower spindle speeds and proper cutters are required.

A very complete equipment of cutters is supplied and additional ones may readily be made or purchased at any time.

The scope of the work possible is realized when it is used for recessing and routing, cutting fillets, turning and boring, mortising and tenoning, and other pattern shop operations.

The machine can be fitted for either countershaft or motor drive and in the latter case a 5 h. p. motor is required.



VIEW SHOWING TOP OF TABLE IN A TILTED ANGULAR POSITION

MAKING MATERIALS PAY

THERE seem to be solid grounds for believing that the German Government has selected its expedient for raising revenue to pay for the war. Without foregoing hopes of indemnities, it has accepted the certainty that large obligations will have to be met by taxation. Desperate diseases justify desperate remedies, and the Germans are not counting upon profits tax, income tax, or Customs duty to get them out of their difficulty. The favored remedy is more heroic, being nothing less than 30 per cent. impost upon raw materials. Metals, coal, oil and textile fibres of home production will be made to yield one-third of their value upon the average to the State, and in this way it is hoped to raise towards $500,000,000 a year.

The decision, when it is finally ratified, will have interest in relation to international trade, for we may assume that the burden cannot by any means be confined to goods for home consumption. The system adopted will severely handicap German industry in foreign competition for a few years, but it will provide for a fairly early release, when it is no doubt hoped that German export business will leap ahead.

Britain, for instance, will have a dragging financial burden to impede its trade movements, however the weight be distributed and irrespectively of whether one means or another is taken to discharge it. The British have a better chance than the Germans of lightening the weight by imposing taxes upon raw products, if that course should seem best, and it is manifest that German action in that regard ought to influence their decision.

Nobody likes taxes upon the raw products of his industry, but the choice lies between evils, and a great deal is to be said for any system that promises to be severe but short as against systems nearly as onerous which are interminably long. The enemy's action lends a decided impetus to proposals for putting the cost of the war upon the price of raw materials.—M. L.

◆

ADDING ALUMINUM TO BRASS

THE habit of using aluminum in brass founding has become very strong with some operators, the purposes for which it should be added being ignored and every pot of metal receiving a dose varying from two to eight ounces. Apart from any deoxidisation which is effected, the usual result is to give a bright golden color to the castings, and assuming that they are to be used as they leave the moulds, their appearance is very desirable. If however the articles are to be dipped and lacquered, or silver or nickel-plated, the aluminum is fatal to good work, as its rapid oxidation prevents regular working either of the acid or plating baths, dry polishing being the only available method of dealing with brass containing aluminum.

◆

RESEARCHES ON TIN AND TUNGSTEN

THE *Board of Trade Journal*, London, England, says that one of the most attractive fields for investigation being opened by the exigencies of the war is that which pertains to the winning of tin and tungsten. Recently some successful experiments have been made with a view to increasing the recovery of tin. No systematic researches, however, have been undertaken beyond those designed to improve the appliances now in use; and, having regard to this fact, the Privy Council Committee for Scientific and Industrial Research has expressed the hope that a research association might be established in order that the series of investigations already undertaken might be continued with fresh vigor on a larger scale.

One of the difficulties in the way hitherto has been the want of adequate funds for sustained investigation and experimental trials. But the Ministry of Munitions, represented by the department for the development of mineral resources, is now venturing on a strong effort to make progress possible, and is suggesting that those interested in the tin and tungsten mines of Cornwall and Devon should co-operate in the establishment of a research association, and contribute to a central fund devoted to a study of the many-sided aspects of the problem. In this way adequate means might be provided annually for fund, supplemented if necessary by a grant from the Committee of the Privy two or three years; and with such a Council, experimental researches upon scientific principles could be conducted.

◆

INCREASING THE SAFETY FACTOR

By R. Hamilton

IN adopting safety methods in the factory it is good policy to solicit the assistance of the workmen in devising ways and means whereby the danger of accident may be minimized. Invariably, when a safety measure is adopted in a plant it is done so without previous consultation with the workman whom it is supposed to benefit. The disposition of the man is the prime factor in the success of any innovation, and in order to assure the greatest efficiency for a safety appliance or regulation it is well to impress upon the workmen the advisability of its use before applying the device to the machine upon which it is to be used. If it is seen that their co-operation is desired the workmen will adapt themselves more readily to methods that are evolved for their protection.

An effective device must be acceptable to the worker otherwise antagonism will follow its installation, and the result is liable to prove unsatisfactory owing to the initial prejudices engendered in the mind of the workman. Employees should be encouraged at all times to study the problem of the prevention of accidents, and induced to take an active interest in developing methods for their own and duties.

◆

B.C. GOVERNMENT TO INVESTIGATE IRON ORE DEPOSITS

AN intimation that the B.C. Government will probably amend the Mineral Survey and Development Act so as to enable the mines department to drill and test several iron ore properties without penalizing the owners with the double cost which the act provides, was given by Hon. William Sloan, Minister of Mines.

Hon. Mr. Sloan is to select the outside engineer to report on the project to establish a thermo-electric smelter and plate mill at Vancouver and expects to make his decision within a few days. The minister stated that the B. C. Electric Railway Co. has joined with the Aetna Steel Co. and the provincial government in pledging the cost of the engineer's investigation on which the government will consider lending assistance to start a steel industry on Burrard Inlet.

"The government is alive to the great possibilities which a steel industry may bring to the province in settling a permanent steel shipbuilding industry on the coast and in developing the lighter manufacturing industries," stated Hon. Mr. Sloan, who added that as a further step in developing an iron and steel industry the government is contemplating an amendment of the Mineral Survey Act.

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THE NEEDS OF CANADA IN REGARD TO INDUSTRIAL RESEARCH

THAT scientific industrial research has proven its worth in cold cash as a business investment was stated by Professor F. C. Fields of Toronto, in a recent public address, although the initial cost of such expenditure is one of the chief obstacles to a more liberal attitude towards research on the part of many manufacturers.

Figures given by Professor Fields regarding such work in America are illuminative:

"In the case of one firm, an investment of $25,000 in two years had yielded assets of $200,000 and an annual profit of $1,000,000. In another case the same investment in 18 months was bringing a profit of $50,000.

"In one instance an investment of $25,000 in four months paid $1,500 per day."

Such instances of course are confined by the nature of circumstances to a limited number of firms, and in the broad national aspect are not of benefit to the population as a whole except via the sales department of the firm making the investment. All that is right and proper, but such a feature differs essentially from British practice which has been considerably accelerated of late.

The "State Department of Scientific and Industrial Research" in Great Britain has a fund of a million pounds sterling at its disposal and among its activities it has been founding co-operative laboratories for manufacturers in similar industries, the department defraying the costs.

The Council of Industrial and Scientific Research in Canada has ample precedent for its existence and while numerically its results may be less than those of similar bodies of other countries, it is a national necessity and as such should be kept closely in touch with by manufacturers throughout the Dominion.

Only by knowing what to look for can the efforts of such an institution be efficiently directed, and while natural resources offer many fields of application, the industrial life of the Dominion will become more consolidated if manufacturers once see the possible benefits to be derived by judicious consultation with the council.

INTERNATIONAL INFLUENCE OF U.S. MACHINERY DEALERS' CONVENTION

CANADIAN machinery manufacturers and dealers are taking more than passing interest in the thirteenth annual convention of American associations connected with this branch of industry.

Just as the United States did not at first fully realize the magnitude of Canada's war effort, so are we liable to be misled by incorrect, exaggerated, and otherwise erroneous reports regarding our ally's activities.

Much information of a military nature will not be available, but much information, of a kind designed to assist individuals and firms in the efficient discharge of their duties as loyal citizens of a country at war, will be made available by the three supply and machinery associations concerned.

The event is particularly interesting in many ways. Secretary of War Baker; Charles A. Hinch, president of the American Bankers' Association; Fairfax Harrison, president of the Southern Railway, are expected to deliver addresses.

The impressive aspect of the convention is that machinery dealers and manufacturers are receiving the approval and personal co-operation of government, banking and allied interests in their efforts to serve their country.

It is now thirteen months since the United States declared war on Germany. Much of that time has been too strenuously occupied with active preparation. Although the first rush is still on and will be on till the end, the organizing instinct, the team-work microbe, has now got to the surface and the racial characteristic for co-operative discussion will be given full play.

Canada missed much of this propaganda work when it was most necessary, but just as peace time knowledge has been utilized in war, so can war time activities and ideas be studied with a view to peace however distant. Personal addresses by prominent officials of the leading industries concerned will be of a nature calculated to exert a powerful and beneficial result on the efforts of those concerned.

The closely allied and parallel paths of Canada and her big neighbor make the event truly international in the machinery world.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

CORROSION OF IRON AND STEEL AND ITS PREVENTION—
PART IV.

By Abe Winters

RUST-proofing by the immersion of iron or steel in phosphorized solutions has proven very satisfactory for many purposes, but, as is the case with many other very excellent ideas, the process is not adapted to all requirements met with in the various industries. The process of phosphorizing iron or steel surfaces consists of two essential operations, namely: (1) Preparing the iron or steel surface. All scale or non-metallic substance must be removed and the surface must be as clean as for high grade enamelling. All metal coatings, such as nickel, copper, brass, zinc, tin, etc., must be removed. The surface of the article to be treated must be ferrous and chemically clean. Sand blast or pickle is used for this purpose; sand blast is preferable; (2) The rust-proofing process consists of immersing the iron or steel in a very dilute aqueous solution of phosphoric acid, manganese dioxide and ferric oxide. The solution as employed is 90 per cent water. The solution is maintained at 212 degrees Fah. during the entire processing of metal. Boiling increases the action of the solution on the metal by reason of agitation. Baffle plates are used in the tanks to obtain a proper circulation of the solution over the metal surfaces being treated.

When the iron or steel is first immersed in the solution a very copious flow of gas issues from the pores of the metal. The amount of gas liberated depends upon the quantity of chemicals in the solution, the temperature of the bath, and the porosity of the metal being treated. The evolution of gas continues until the surface of the metal is entirely converted into a mixture of the ferrous and ferric phosphates, then the action ceases and the operation is finished.

Proportions of Chemicals Used

The proportions of chemicals required for a bath are 75 per cent phosphoric acid to 1 per cent manganese dioxide and ferric oxide mixture, the latter chemicals accumulate at the bottom of the tank under the baffle plates from which it is removed and thrown away; the phosphoric acid employed by firms operating certain patented phosphorizing processes weighs 22½ oz. per pint. One pint will acidify one thousand gallons of water to 1 point as per NaOH test for acidity; 14.5 points is considered normal acidity, or 20.35 lbs are required to raise 1,000 gallons of water to 14.5 points.

The first chemical cost per 1,000 gallons equals $3.67. Additions of fresh acid must be made before beginning each batch. Then the solution is tested for acidity and the normal point acquired. The average cost of operation approximates $40.00 to $50.00 per ton if chemicals are purchased from the patentee, but this would be greatly reduced if they were procured in open market.

The time of treatment varies from 1 hour to 8 hours. No electric current is used, the process being one of simple immersion in a boiling solution of the proper quantity of previously mentioned chemicals. The processing solution is tested as follows: 10 c.c. of processing solution is taken in a beaker, 5 drops phenolphthalein added as an indicator and the solution filtrated with a one-tenth normal solution of sodium hydroxide (NaOH); 8 oz. of manganese dioxide (MnO_2) is required to each pint of the acid solution.

Penetration

When iron or steel is immersed in the boiling solution an action takes place upon the surface of the metal and is indicated by the liberation of hydrogen, the treatment continues until all action ceases or the hydrogen is no longer liberated. The theory of this action is that the ferrous surface is gradually converted to a ferric condition and becomes coated with an insoluble basic phosphate of iron. The action of the solution upon the metal or at least the evolution of hydrogen is much more pronounced in the case of cast iron than with sheet steel, and the harder the steel the less intense is the action, and the time required for processing is increased. A penetration of .004 inch is claimed for this process. The writer has conducted several tests to determine the accuracy of this claim and has failed to obtain a case which verifies the statement. A magnification of 330 diameters does not reveal any appreciable penetration. Furthermore, the temperature of the metal in process is never more than 215 degrees Fah., and we fail to understand how this temperature can open the pores of hard steel sufficiently to permit of a .004 penetration by the acid solution. A penetration of .004 inch may be possible in grey iron castings if the treatment were given under ideal conditions.

These phosphorized metal surfaces are not resistant to friction, running boards of automobiles, handle bars of bicycles, etc., quickly becomes a prey to rust where worn by the feet and hands of the persons using the vehicles. The phosphorized rust-proofing treatment is said to prevent the spread of rust if a portion of the metal surface is exposed. Tests by responsible persons in various localities do not confirm this claim, and as the penetration in average cases does not exceed .001 inch it is obvious that there is no resistance to spread of rust at points where the surface coating has been removed by a sharp-edged article.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers 1917-1918

President—T. Charles Orr, 281 Westmoreland Avenue, Toronto.
Vice-President—James Vallier, 701 Crawford Street, Toronto.
Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ont.
Sergeant-at-Arms — John Lougheed, 339 Lippincott Street, Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

Electro-Plating Impossible on Phosphorized Surfaces

Certain promotors of phosphoric acid rust-proofing have emphatically declared that phosphorized surfaces can be electro-plated. This claim has naturally attracted the manufacturer of plated wares as it appeared to be a short cut to durable and rust-proof plated surfaces on iron and steel. To any who have been thus informed we would say, go slow, as iron or steel surfaces which have been processed by immersion in rust-proofing solutions containing phosphoric acid, manganese dioxide and ferro oxide cannot be electro-plated with any metal in any solution, because the film produced over the surface of the metal is a non-conductor; the iron or steel is very effectively insulated and absolutely protected as far as electrolysis in the plating bath is concerned.

If the surface film is removed electroplating is possible, but the protection afforded by the rust-proofing is destroyed, as no appreciable penetration is effected, therefore the phosphoric acid and manganese dioxide treatment of iron or steel is not adapted to such goods as are to receive a subsequent coating of metal by electro-deposition. We are not aware of any firm using the phosphoric acid process for rust-proofing steel and relying on the simple process alone for efficient protection to iron or steel.

In every case the processed metal is given a final coating of either oil, wax, paint, japan or enamel, the most enthusiastic advocate of phosphorized metal surfaces which the writer has met admitted that all processed metal should be given the protection afforded by the previously mentioned substances. As stated previously the rust-proofing of iron or steel by treatment in solutions of phosphoric acid, manganese dioxide and ferric oxide has proven very satisfactory for many purposes, but is not adapted for the general requirements of metal protection. The process is expensive if operated efficiently. Stove manufacturers have regarded the process with considerable doubt for several years and to-day are practically convinced that it is of no value as a prevention against rust on stoves, ovens or cast iron which is subjected to excessive heat.

Strong Solutions Detrimental

Another objection to the process is the inefficient protection which results from treatment in solutions which have been loaded in excess of the chemical capacity, one company claims fully 50 per cent of their product was thus treated. The process does not require a skilled operator but it is essential that he should be possessed of a fair degree of horse sense. The writer has pieces of steel undergoing atmospheric exposure tests, these have been treated by various rust-proofing processes and the result of the test is at present favorable to no particular method where phospheric acid is used. At present our conclusions relative to these phosphorized surfaces is as follows.

That the repellant nature of the surface of iron or steel toward rust is increased by proper treatment in aqueous solutions containing phosphoric acid, manganese dioxide and ferric acid is unquestioned, wrought iron and steel of various methods of manufacture are greatly influenced in corrodibility by the amount of phosphorous contained in them. With one per cent. of phosphorous present the corrosion is a little over one half as great as in cases where the iron is free from phosphorous. If two pieces of steel containing different percentages of phosphorous are immersed in salt water, in contact, the low phosphorous specimen will corrode more rapidly that the high grade metal. Iron alloyed with chromium, cobalt or nickel will resist corrosion in a similar manner.

If phosphorous act as a deterrent to corrosion when introduced into an alloy it is reasonable to expect that an insoluble film of basic phosphate of iron over the surface of ferrous metals would repel corrosion more or less. The effectiveness of such films naturally depending upon the nature of the vehicle in which the film was produced, the manner of treating the metal and time allowed for processing. "Rust once established, carries within itself the elements of a ceaseless life; even in a glass bottle rust begets rust."

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Questions and Answers

Question.—In finishing a cold rolled steel stamping we take the steel direct from stock, punch, form and drill the pieces, polish one side, clean by electro method, copper in cyanide copper bath and nickel plate for one hour. From 50 to 75 per cent. of the pieces prove failures by reason of nickel peeling from the side which is not polished, during a subsequent assembling operation. The only way we have found to avoid the peeling is to scour the unpolished side. This method requires much time, labor and material. Our plater has suggested our enquiring for information as to the cause of our difficulty and a more economical method of treating the condition.

Answer.—If you examine the cold rolled steel as received from the manufacturer you will probably find the surfaces have been protected from corrosion by the application of a thin film of mineral oil. During the treatment of the steel previous to plating there is no operation which would remove this film of oil from the one side of stamping, but, instead, the oil has actually gathered unto the surface varying quantities of dust, greases, etc. The surface faces are quite filled with this mixture when the cleaning operation in the plating room begins. A short treatment in the electric cleaning bath by direct current will not produce a chemically clean surface, owing to the production of a soap film which hardens when transferred to cold water. To avoid peeling of the metalled deposits you may resort to one of the two following methods. Use direct current for usual time, change to reverse for 5 seconds (with E. M. F. of 5 volts), then use direct current for at least 1 minute, rinse in the hot solution and proceed as formerly, eliminating the scouring.

Second method. Tumble in clean sawdust moistened with coal oil, for 10 minutes; speed, 20 to 30 r. p. m. The latter method is preferable, results being less variable.

* * *

Question.—Each commutator bar on our plating dynamo is pitted along one side of the insulation, the side first approaching the brushes when machine is in operation. We cannot detect the smallest spark, yet each day the bars show evidence of freshly made pits. The machine is practically new and we fear serious injury if the condition continues. What shall we do to prevent the pitting, and remedy the damage now done?

Answer.—Evidently the brushes have not been shifted to the non-sparking point. The sparking has been very small except possibly at certain periods, such as when starting the machine or when operating under greatest load. Nevertheless sparking has occurred and is responsible for the pits. Remove all brushes from the machine, rotate the commutator as when in operation and smooth off the commutator by using fine sandpaper attached to a block formed to fit a section of the commutator accessible between the brush holder arms.

When pits are removed in this manner, wipe off the dust from commutator and surrounding parts of machine, apply a very small quantity of cylinder oil to the commutator while latter is in motion, clean, trim or file all brushes and adjust them carefully with due regard to contact. Shift the rocker arm forward slightly and start machine. If slight pitting is still noticeable when machine is examined after usual operation following above adjustment, shift rocker arm forward in direction of armature rotation again, a very small movement forward should suffice. Keep commutator lubricated, but do not allow oil or greast, copper dust or lint to accumulate on any portion of the machine if you desire efficiency and freedom from current irregularities.

* * *

Question.—I would like to ask for information about plating and finishing troubles quite frequently but as I have received many refusals from platers I have begun to feel rather dubious regarding the advisability of seeking advice from a trade publication. At present my chief difficulty consists of steel parts rusting. I tumble steel parts by wet process, using soda ash as lubricant. After tumbling the pieces are rinsed in cold water, passed through hot water and dried in clean sawdust, then removed to machine shop and threaded. Frequently the goods do not return to plating department for finishing until several days have elapsed.

In the meantime a large proportion of the pieces have acquired appreciable rust which necessitates a special operation for its removal. This operation is expensive and the final cost is increased to a figure which is objectionable to the company. Can you publish information covering my difficulties and assist an isolated plater?

Answer.—When you encounter a problem in plating, polishing or any branch of these operations we shall be pleased to assist you if you have endeavored to solve the problem and failed. State your case, giving full details of conditions as they exist and as they are desired, and we will gladly consider the question and publish the reply. The rusting of steel goods following wet tumbling and prior to plating may be entirely avoided by the use of Oakite platers' cleaner, commonly known as O. P. C. Make up a solution by dissolving 8 ounces of O. P. C. per gallon of boiling water. Remove steel goods from tumbler, rinse in cold water and immerse in the boiling O. P. C. solution and spread the goods on perforated tray to dry. Do not use clear hot water or sawdust for drying. Better results in tumbling may be obtained by using 1 ounce of Oakite compound No. 2 per gallon of water instead of soda ash.

Some platers who have facilities for heating the solution during tumbling operation remove the steel goods direct from final tumbling treatment and dry by use of perforated tray as above mentioned, thus eliminating rinsing and sawdust treatment. Oakite is the only material we are aware of which permits the plater such absolute security and at the same time reduces labor costs.

WORLD'S PRODUCTION OF PLATINUM

FOR many years past Russia has maintained practically a monopoly in platinum, as other countries only account for less than 7 per cent. of the world's product; for instance, in 1911 the figures for the principal countries were as follows:

Country.	Output of platinum in 1911. Kilogrammes.	Per cent.
Russia	5,766	93.1
Colombia	373	6.1
United States	29	0.5
Australia	21	0.3
Total	6,189	100.0

All the commercially important platinum areas in Russia are concentrated within the confines of the Ural mountains, and occupy only a very limited area. The deposits are associated, as is well known, with a peculiar type of olivine rock, called dunite; and platinum seems particularly abundant where dunite, containing chrome iron ore, is in contact with the normal olivine rock. It is remarkable that the commercial deposits of platinum are very nearly always associated with the basic rocks, dunite and peridotite, although the metal is known to occur in America in association with quartz and other acid rocks.

As a result of the war, however, the production in Russia has sunk to one-quarter of its previous dimensions; while on the other hand, Colombia, owing to the unprecedented prices commanded by platinum, has been enabled to increase her production by more than 60 per cent. Compared with these two countries, the United States, British Columbia, Brazil, Borneo, etc., make a very small contribution to the world's production.

The tremendous influence exerted by Russia upon the world's total is reflected in the fact that owing to the large decrease in her output, the world's output has also fallen to one-third.

Analyses show that the platinum deposits occur pure, but as a mechanical mixture with metallic iron, containing 73.1 to 90.98 per cent. of the precious metal. Associated with the latter are small quantities of the platinum group of metals, namely, iridium (0.22 to 5.39 per cent.), osmium, palladium, rhodium and ruthenium.

It may be interesting to reproduce some figures which are given, showing the share taken by the various arts in the employment of platinum. For instance, dentistry accounts for 45 to 54 per cent.; jewelry, 34 per cent.; the production of spongy platinum, 3.5 to 5.5 per cent.; while chemical vessels, surgical appliances, etc., consume 6.5 to 7.5 per cent.—*Russia.*

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PATTERN POINTERS

By D. A. Middleton

"One reason why I always like to mould the Duplex Co's work is because they round all the corners on their patterns," said a moulder. "You know if you are going to machine a casting, is takes anywhere from an eighth to a quarter to clean it up even the smallest ones have to have a sixteenth, and that means that you could round the corner to a radius of from one-sixteenth to one-quarter depending on whether only one surface is machined or two adjacent ones at right angles." Then again if there is no machining to be done, you can't expect iron to fill up a sharp corner nor the average moulder to do his work that way—he'll make the little fillet in there if you don't—so you might as well round the pattern to begin with and have a better looking pattern, better wearing corners on it, and make the moulder a lot less trouble in drawing it. And where you are depending on an outside foundry for your iron, it pays to get the good will of the moulders in it."

Before sending core boxes to the foundry, it is a good plan to try them out by filling with plaster of Paris and making a core for measuring and inspection purposes. This applies more particularly to small work—manufacturing—where a little difference in the cored piece causes a big expense item in unnecessary shop work.

In some lines of manufacturing and in experimental work, steel parts are set in cast iron sockets or handles by running the iron around the steel. The pattern practice for this kind of work is to make the pattern as usual, adding to it an extension of the size of the steel part which is exposed when the article is completed. For instance, the heads of vise screws are sometimes cast on the screw and the pattern, besides the head part has a cylindrical part as big and as long as the screw is to be —but without threads. Then the screw is laid in the mould in the space made by the round just as if it was a core. And the iron is poured around it. It helps to make a tight construction if the steel pieces are heated before placing—the relative shrinkage is less. It is also imperative to notch or square or bend the steel pieces so the iron can get a more positive grip than by its contraction alone—the reason for this in the case of a vise screw is evident, the screw requiring not only something positive to drive it but a resistance to keep it from pulling out of the head.

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THE boiling points of many common metals are sufficiently high to indicate that a temperature of at least 1,500 deg. Cent. might be easily read by the aid of liquid couples. The question immediately arises as to whether metals in the molten state develop an E. M. F. suitable for pyrometric work. The results so far obtained indicate that in general the thermo-electric properties are unaffected by fusion, and that a temperature E. M. F. curve shows no diminution of continuity at the fusion point. Exceptions to this rule are furnished by bismuth and antimony, both of which show an abrupt bend in the curve at the melting point.

WAR DEMAND INCREASES VALUE OF CHROMITE

THE mineral chromite is the source of the metal chromium, which, as an alloy in chrome steel and in several chemical compounds, occupies an important place on our battle front on both land and sea. The compounds furnish the strong and durable yet subdued and protective colors that are used to dye the soldiers' khaki clothes and tan the upper leather of his shoes. Chromite readily forms alloys with iron and gives hardness to the steel that is used for armor plate on war vessels and for the armor-piercing projectiles which they hurl at the enemy. It is one of the essential elements in stellite, which is now so largely employed in making high-speed tools for cutting steel in the manufacture of munitions.

Unfortunately for the United States the present domestic output of chromite is scarcely one-fourth of the quantity needed for war and domestic uses, so that the other three-fourths must be imported. According to the United States Geological Survey, most of the imported chromite has come from Rhodesia and New Caledonia, and, notwithstanding the scarcity of ships, much of it still comes from those distant lands. In response to the call for chromite Canada has rendered most efficient help. In 1916 she sent 10,930 long tons and in 1917 she more than doubled her shipments of chromite to the United States.

The domestic production of chromite in 1916 was about 47,000 long tons, and last spring the prediction was made by Government geologists that in 1917 it would reach 48,000 long tons. According to J. S. Diller, of the United States Geological Survey, the latest returns indicate that this prophecy has been fulfilled.

Beds Far From Transportation Lines

Most of the known bodies of chromite are small, and those that lie far from lines of transportation are not available for exploitation by the ordinary miner because of the difficulty and expense of getting the ore to the market.

Much of the chromite on the Pacific Coast is of low grade, averaging about 40 per cent. of chromic oxide, and on that account is of less value than the imported ore, which generally contains 50 per cent. or more of chromic oxide.

Nicaragua is shipping a small quantity of ore. At Antioquia, Colombia, chromite is reported to be so abundant that it has been used to build the walls of houses. Brazil has valuable deposits several hundred miles north-west of Bahia, and may yet become a contributor to our needed supply.

Most of the chromite is needed in factories in the eastern United States, and on account of the difficulty and expense of long transportation from the western deposits one of the most urgent present needs is to increase the production of chromite in the Atlantic States.

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The addition of small quantities of molybdenum and chromium to iron by an experimenter in Europe has produced a practically acid proof alloy.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	28 00
Copper, electrolytic	28 50
Copper, casting	28 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	22 50
Copper, heavy	22 50	22 50
Copper wire	22 50	22 50
No. 1 machine composition	22 00	21 50
New brass cuttings	16 00	14 00
No. 1 brass turnings	15 00	15 75
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	20 50
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	31 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	20 00	13 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	7 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 47
Solder, guaranteed	0 50
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	8 95
Premier 10¾ oz.	13 85	9 25
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to	$0.54
Cobalt	1.75 to	2.00
Copper	.44 to	.46
Tin	.49 to	.56
Silver, per oz.	1.05 to	1.00
Zinc	.23 to	.25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Arsenic, white	.12
Caustic soda	.07
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate ......(per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.41
Sodium cyanide, 98-100%	.38
Sodium hydrate	.04
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.		$3 25
Polishing wheels, bullneck		2 00
Pumice, ground		07
Emery composition	10 to	6- 9
Tripoli composition	06 to	9-10
Rouge, powder	.30 to	.35
Rouge, silver	.50 to	.55
Crocus composition	08 to	8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 38
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

The General Market Conditions and Tendencies

TORONTO.—The steady trend of prices that has been current for the past few weeks in the local market shows signs of breaking, and it begins to look as though the break were going to be on the upward plane. High speed goods in some lines go from 40 to 60 per cent. on list figures. Jobbers in steel plate say that although they have not advanced prices so far, they are about to do so. It was only a month ago that plate dropped from the ten-dollar mark to the nine (per hundred). It looks as though this figure would be of rather short duration, and although it is much higher than the fixed price quoted in the United States, the tendency is that the ten-dollar mark would be restored in a few days.

Dealers in scrap metals are in the same position. Local figures have not been advanced, but the tendency is towards higher price. The action of the American Government in making a demand for all material for war work for sixty days is, the dealers state, going to make a bigger demand for heavy melting steel and for its counterpart in scrap metals.

The munitions business keeps up a brisk demand in the machine tool and supply business. Orders for the 155 m.m. shell are being placed, and a new plant is being erected for one Toronto firm to do this class of work. Other plants that have been handling six-inch work are turning over to this business, for the 155 m.m. is in reality a slightly changed form of the six-inch, orders for which have formed the backbone of the munitions business in Canada for some time past.

Steel May Go Up

Jobbers handling plates are not keen to take on any too much business at listed prices, the base price of $9 per hundred is still good in Toronto, although outside points in Canada are now quoting one dollar in excess of this mark. The Canadian dealers have been informed by the Canadian Government war mission at Washington that no further orders can be filled for steel plates on warehouse orders. In other words the new regulation means that there is no chance now of passing any of this material into stock, as the situation is so imperative that it is necessary that all this material should pass into actual war construction as soon as possible after leaving the rollers. The effect of this is that the dealers are going to conserve the stock they have on hand by increasing the prices. Buying will be more limited than formerly, and every effort will be made to see the motive prompting the latest decree from the War Board finds effect in practice. Boiler makers will also find that they must carry on their business on a more hand to mouth scale than ever, and their purchases will have to be made largely for the special jobs that they have in hand. It may make work a little slower, as it will be impossible to keep stocks on hand in anticipation of orders that might be legitimately expected to come in.

The supply of tubes, especially for the smaller sizes, around two inches, does not improve, and prospects are not good for any betterment in this direction. The four-inch shipments are coming in a little better, some cars of these having reached Toronto to-day. The scarcity of small tubes can probably go right back and be blamed on the shortage of all material that passes through the open hearth furnaces. Just now there is a very decided shortage in skelp and the tube situation is bad in consequence. Boat owners are in a better position than might be imagined, as they anticipated the situation and made their purchases for winter repairs in good season.

Scrap Metals

Dealers are not anxious to take on much business just now until they are a little more certain of the future prices. In common with other products, the scrap metal stock is coming to the point where higher values are in sight. One dealer said to CANADIAN FOUNDRYMAN, "We are paying more for scrap metals in Canada now than we can sell for in the United States centres." He produced correspondence to prove his point, and had he sold at the prices offered in Boston he would have lost by the transaction. This same dealer intimated that a contract was in the making whereby his firm would take in cuttings from a munition plant that would run into figures from $150,000 to $200,000 in a period of three months, giving some idea of the extent of the trade in this direction. Some copper and brass in the way of scrap metal crosses the border, this being possible under license only. Other lines are barred by the Canadian embargo. The dealers anticipate the next move will bring higher figures, anticipating a demand for heavy melting steel, although there is the fixed value of $24, past which the price cannot go. The action of the United States Government in using all the mill output for sixty days will mean increases in the scrap trade, at least that is the interpretation of the dealers.

Machine Tools and Supplies

High speed goods are quoted up again, the incessant demand for war machinery being undoubtedly the cause. Brown & Sharpe cutters have been 40 on the list price, but to-day the price is given out as plus 60. Drills are up aagin, and the double list is used to indicate their price. The placing of American munitions orders in Canada keeps the supply houses busy. The business offering now consists largely in the 155 m.m. on American orders, and at least one plant in Toronto is being fitted out for this business. American business is desirable now, highly so, as every dollar of this sort helps to correct the balance of trade which has come to the point where it is a matter of serious inconvenience.

One Toronto firm that has had a very large and successful run on the 6-inch business, is making preparations now to turn over to American business, the 9.2 being the size they will turn out.

Metals

Prices of non-ferrous metals, locally, are holding firm, but tin is the only one that has advanced. The tin situation continues acute with no relief in sight. A meeting was held in Washington last week to consider the question of raising the prices of copper, but no decision was arrived at. In the meantime the market is steady and firm. Lead, spelter, antimony and aluminum are steady and unchanged. Business locally continues brisk.

Copper.—The War Industries Board and the copper interests met in conference in Washington last Thursday but adjourned until May 22 without arriving at any decision in regard to revising the fixed price of copper. It it understood that an increase from 23½c to 24½c a pound will be asked, the advance to be used chiefly to offset the higher refinery costs. Consumers are reported to be well covered by contract and apparently there is no shortage of metal for any purpose. Lake and electrolytic are quoted at 28½c and casting at 28c per pound.

Tin.—The tin situation is unchanged and the shortage continues acute. There is no spot metal for any grade for sale and only Chinese tin apparently can now be purchased for future shipment from the Far East. Tin has again advanced locally and is now quoted at $1.15 per pound or 10c higher than last week.

Spelter.—The market is firmer, due to a report that the U. S. Government has purchased a large quantity of high grade spelter, 9,000 tons it is said, at around 10c, St. Louis basis. Prime Western spelter continues quiet and the market featureless. The local price of spelter is unchanged at 9½c per pound.

Lead.—The primary market is easier and lower prices are anticipated. The weakness in the market is attributed to an increase in Mexican production and lack of buying for domestic account, the latter being probably due to the expectation that the market will go lower. In the meantime local price of lead is unchanged at 8½c per pound.

Antimony.—The demand is more active and firmer again. It is understood that the U. S. Government has asked bids on 1,000 tons of antimony for May-June delivery. Prices here are firm and unchanged at 16c per pound.

Aluminum. — The market continues steady. Practically all the aluminum output is being taken by the U. S. Government at the fixed price of 32c for 98 to 99 per cent. in 50 ton lots: Local price 50c per pound.

ALASKA MINERAL PRODUCTION

IN 1917 Alaska produced minerals valued at $41,760,000. These are the advance figures issued by the United States Geological Survey, Department of the Interior, and are based on estimates made by G. C. Martin. The value of the mineral output of Alaska in 1917, although about $6,870,000 less than that in 1916, was greater than that in any other year. The most valuable mineral product in 1917 was copper, of which 88,200,000 pounds, valued at $24,000,000, was produced. This is less than the output of 1916, which was 119,600,000 pounds, valued at $29,480,000, but is greater than that of any other year. The reduction is due largely to labor troubles and is not necessarily permanent. The gold produced in 1917, $15,450.000, of which $9,850.000 was derived from placer mines, was also less than that produced in 1916, which was $172,240,000, and is the smallest since 1904. The reduction was due chiefly to curtailment of operations because of the scarcity of labor and the high cost of materials, but in part to the disaster at the Treadwell mine and depletion of some of the richer placers.

During the year Alaska also produced silver valued at $1,050,000, coal valued at $300 000, lead valued at $160,000, tin valued at $160,000, antimony valued at $40 000, and tungsten, chromium, petroleum, marble, gypsum, graphite, and platinum valued at $600.000.

During 33 years of mining Alaska has produced more than $391.000.000 in gold, silver, copper, and other minerals. Of this amount $293 000 000 represents the value of the gold, and $88,200,000 that of the copper.

TRADE GOSSIP

Montreal, Que.—The Montreal Locomotive Works will build an addition to their foundry at Longue Pointe. The Dominion Bridge Co. have the steel contract.

Harry M. Marsh, for the past six years Commissioner of Industries and Publicity for the City of Hamilton, resigned that office on April 1. **C. W. Kirkpatrick,** well known newspaper man, was appointed by the City Council to the position and assumed his duties on April 15.

Acquire Zinc Concentrates.—A report from Melbourne, Australia, states that the British Government has contracted for the purchase of virtually the whole product of Australian zinc concentrates for the period of the war and a decade thereafter.

Fort William, Ont. — The Nipigon Reserve Iron Co., has opened an office here with J. W. Newcombe in charge. The company, which is capitalized at $375,000 will develop 200 acres of iron land in the Nipigon district.

Welland, Ont.—The Volta Mfg. Co. will build an addition to its plant here. The extension will be 50 feet by 50 feet, of brick construction, and will be used as a machine shop. The company manufactures electric hoists and electric furnace controllers.

Extending Plant.—The Swedish Crucible Steel Co., Windsor, are building a 100 ft. extension to their foundry, and will also build a machine shop 75 x 100 feet. In the foundry extension they will install three fourteen-ton moulding machines by which the company's production of large steel castings will be very considerably increased.

Electro Galvanising.—T. Scott Anderson of Sheffield has issued an interesting little book on electro galvanising, cleaning and welding, dealing with each of these matters in an interesting manner. In referring to electro-cleaning of iron and steel he points out there is no loss of iron, no limit to the dimensions of the work, the structure of the metal is not injured and the process is harmless and economical.

Hull, Que.—The Hull Iron & Steel Foundries, Ltd., is building a new cleaning department with all necessary air hammers, clippers, grinders, etc., also new annealing ovens, together with electric and oxy-acetylene welding outfits. This building will be 100 ft. by 300 ft long, with private siding for all outgoing shipments. The company has just put into operation a six-ton electric furnace, using a 1,200 k.v.a. transformer and special automatic regulating equipment for raising and lowering electrodes.

New Ferrosilicon Plant in Quebec.—Walter Sharpe, 314 Grand Allee, Quebec, has the general contract and the Eastern Canada Steel & Iron Works, Ltd., the steel contract for the erection of a ferrosilicon plant at Beaupre, Que., for the Laurentian Power Co., Seven Falls, Que., to cost $300,000. The plant will be of brick and steel construction, and will have three furnace rooms, each 15 x 50 ft. The electric station for supplying the furnaces with power will be 20 x 160 ft. It is exepected that the plant will be completed and in operation within three months. The company has a large contract with the Imperial Munitions Board. The plant will have a capacity of from 12 to 15 tons per day.

Halifax, N.S.—The foundry of Hillis & Sons, Ltd., which was destroyed by explosion last December, is to be rebuilt on the Kemp Road. It will manufacture Richmond ranges and foundry products of all kinds. Contracts for a temporary foundry and machine shop have been awarded to the Eastern Investment Corporation, Halifax, and work will begin at once.

Midland, Ont.—The smelter at Midland, which has lain idle for several years, has been acquired by Midland, Cleveland and Duluth interests. Employees of the new company are already preparing the premises for the new machinery and appliances, which will be rushed forward with all possible despatch. The company will manufacture pig iron, and hope to be in full operation within two months.

Vancouver, B.C.—By the provisions of the ore bounties bill passed at the concluding session of the house in Victoria a decided boon is given to the iron industry in the coast province. The province is given power in the measure to give a bonus of three dollars per ton of pig iron which is made in British Columbia from B. C. ore. In speaking in the house on the bill William Sloan, minister of mines, stated that there was sufficient iron ore in sight in the province to insure production for twenty-five years.

Big Nickel Merger Contemplated.—The amalgamation of the International Nickel Co. of Canada and Canadian Copper Co., of Sudbury, Ont. in a fifty-million-dollar concern, with the ultimate purpose of making Ontario not only the dominant producer of nickel ore, but the centre of the world's nickel refining industry as well, is stated to be the plan upon which those interested in the industry are now working. No official confirmation of the report is available, but Mr. Britton Osler, provisional director of the International Nickel Co. of Canada, admitted that the increase in the company's stock from $5,000,000 to $50,000,000, which was approved at Ottawa recently, was "suggestive." The circumstances in connection with the increase in the company's capital indicate that important plans are under consideration. The International Nickel Co. of Canada came into existence on July 25th, 1916. The International Nickel Co. is building a large refinery at Port Colborne, Ont.

Hamilton, Ont.—Officials of the Steel Company of Canada are making efforts to secure coal mines of their own so that they will not have a recurrence of the trouble experienced last winter in getting coal supplies. This follows the important success of the company in purchasing iron ore deposits. It is vital that the big Canadian steel industries have their own raw materials if they are to wage successfully the post-bellum commercial wars. F. H. Whitton, the general manager, stated recently that there would be no difficulty in placing the entire 1918 output. He pointed out, however, that prices for most products would probably be lower and cost would be higher, wages already having been advanced. The company contemplate making considerable extensions to the plant this year.

CATALOGUES

America's Airplanes is the title of an interesting book published by the Gisholt Machine Co., Madison, Wis., giving a brief pictorial history of aircraft development and showing how the Gisholt turret lathes are used to manufacture some of the mechanical parts. The first section illustrates a few of the more notable airplanes and hydro-aeroplanes, showing the development that has been made in the design of aircraft. The second section shows the Gisholt turret lathes and how they are tooled for the various operations for producing some of the more important mechanical parts. This section includes the operations performed for the production of cylinders for Gnome engines.

Recuperative Gas Oven Furnaces is the title of Bulletin No. 160 issued by Tate-Jones & Co., Inc., furnace engineers, Pittsburgh, Pa. This bulletin is devoted to a complete description of the Tate-Jones recuperative type of furnaces as well as an explanation of their advantages and the economy derived from their use. The bulletin also deals with the advantages of recuperation, construction of the recuperator and measuring the temperature of the work etc., The illustrations show the construction of the furnace and also two types of recuperative furnaces, the views being accompanied by tables giving the principal dimensions for the various sizes.

New Publication on Plastic Fire Brick.—Under the title, "How Anyone Can Make a Jointless Gas-tight Furnace Lining," the Betson Plastic Fire Brick Co., of Rome, N.Y., has published a 16-page illustrated folder showing how the plastic fire brick made by them is used in forming one-piece linings for steam boiler furnaces. The old lining of fire bricks or blocks is first removed and the plastic material is then placed in the form of chunks, consodlidated with a mallet and smoothed with a trowel, occupying the same thickness as the old lining. The special mechanical process used in the preparation of this material is said to eliminate expansion and coneraction with temperature changes, so that not only sidewalls, but also door arches, rear arches, and arches for Dutch ovens and other forms of furnace can be formed as solid, monolithic structures. After the terial has been dried and set by a slow fire for four or five hours, the furnace can be put into full service. No molds or special forms are used. The same material is used for ofrming baffles in water tube boilers.

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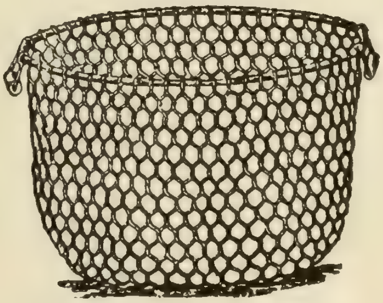

Charcoal or Coke Basket

A Favorite Brush

Bench Rammer

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

WOODSTOCK, April 30.—The scarcity of moulders and the fact that there does not seem to be a well-organized apprentice system in the trade would seem to threaten a serious situation in the foundry business. No industry is more seriously affected than the manufacturer of stoves.

"We have not an apprentice in our shop to-day," said Mr. Charles Stewart of the Stewart Mfg. Co., Woodstock. "It cannot be said that there is no money in it for young men. We have offered unusual wages to beginners but they seem to prefer other work at less money. The men we have with us to-day have been with us for years, and same of them are getting as high as $7 a day. They are good workmen, and under the circumstances are worth the money, but they will not work six days a week. It may be that they are better men for the extra day's recuperation, for they certainly go some while they are at it.

"But the question is, how are we going to fill the ranks as they are thinned out? I understand that there are 200 moulders in Toronto to-day who are working at other trades. Are these men going back to the bench when there is no longer work for them elsewhere? Not likely if they can get as good money and cleaner work. What, then, is the remedy? Another stove manufacturer told me the other day that he had a shop full of apprentices but that they were all foreigners, and therein seems to be the only solution of the problem. Foundries must have moulders and I suppose it is hardly fair to expect the government to require that all tradesmen should seek employment in their own particular trades. That would be encroaching on personal liberty. Let us hope that this is one of the many problems to be solved after the war."

Mr. Stewart observes that scarcity of material and labor and consequent high prices would seem to induce falling off in demand, but it is a present-day peculiarity that the opposite is the case.

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U.S. NAVY VALVE REQUIREMENTS LARGE

Canadian Firm Secures a Contract for Reducing Valves

SOME idea of the magnitude of the shipbuilding activity may be gathered from the data herewith in connection with the recent bid for valves for use of the United States Navy Department. This bid is known as Schedule 1712, steam engineering section, and was opened on April 2. The aggregate number of valves required on this particular schedule is about 834,000, this quantity comprising all types of valves. The class of valve of which the greatest number is required is the ordinary globe valve, the requirements being upwards of 383,000, about 143,000 of these going to the yard at Norfolk, Va. The total number of ½ inch globe valves will be approximately 75,000. The total number of gate valves of various descriptions will be in the neighborhood of 70,000, these include steam and water valves and 100 or more 1½ inch quick opening for low pressure. The bid calls for nearly 2,000 pressure relief valves, including snifting, muffler and air types; 880 are of the flanged variety, ranging from 1 inch to 1½ inch in size. The total requirements for check valves including swing, horizontal and vertical, and will approximate 132,000. Pressure reducing valves will number about 4,000; these will be for reduction from 175 to 25 lbs. per sq. in., exclusive of about 600 of a heavier type requiring a pressure reduction of 300 lbs. per sq. in. to 30 lbs. per sq. in. Radiator valves of various sizes will be required to the number of about 9,000; these include lock shield, renewable disk, and plain globe and angle types. Many of these radiator valves will be nickel-plated; about 1,000 of the ⅛ inch size being automatic. Nearly 1,100 ⅛ inch needle valves will also be required. When it is understood that the above requirements are exclusively for American navy purposes, the activities in the marine field are very remarkable. In connection with the above it might be stated that a certain Canadian engineering firm have received a contract for the manufacture of about 2,500 of the small size reducing valves, the amount of the business being well over $50,000.

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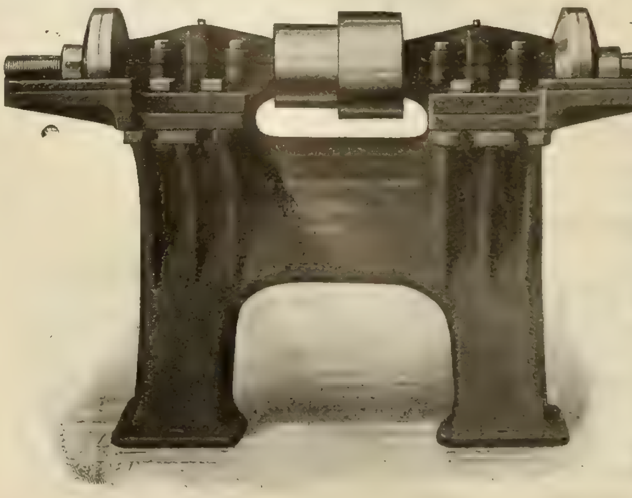

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STEEL TRADE MEETS DEMAND

REMARKABLE expansion in the steel output of Great Britain has been an outstanding feature of the war. The production has grown so that now it is 50 per cent. greater than it was before the war started. The following comment from the London *Iron and Coal Trades Review* explains this unusual growth:

"The work of extending existing plants and of putting down steel works has proceded very satisfactorily during 1917, notwithstanding the obvious difficulties occasioned by the state of war. Several entirely new undertakings are now in active, though not yet in the fullest, operation, and a number of others will be ready early this year. The output of acid and basic steel (excluding steel castings and crucible steel) in the United Kingdom in 1914 was not more than about 7,800,000 tons. In 1916, including steel castings, it had been brought up to about 9,200,000 tons. During the year just ended, taking account of the extensions in hand, it has been increased to 10,500,000 or 11,000,000 tons. This is a remarkable achievement, but when all the new plants are completed the annual production should not be less than about 12,000,000 tons. Government control during 1917 has not only been maintained, but intensified, for practically the whole production has been required, directly and indirectly, for purposes of the war. All engaged have worked with felicitous harmony and goodwill, anxious only to forward the great cause in which they are privileged to play so important and, indeed, vital, part."

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ON May 1st, we are moving our Montreal quarters to our new premises:— Nos. 183, 185, 187 and 189 Wellington Street, Montreal.

WE have built our new warehouse on modern plans and have a large storage capacity, and are in better position than ever to fill orders promptly.

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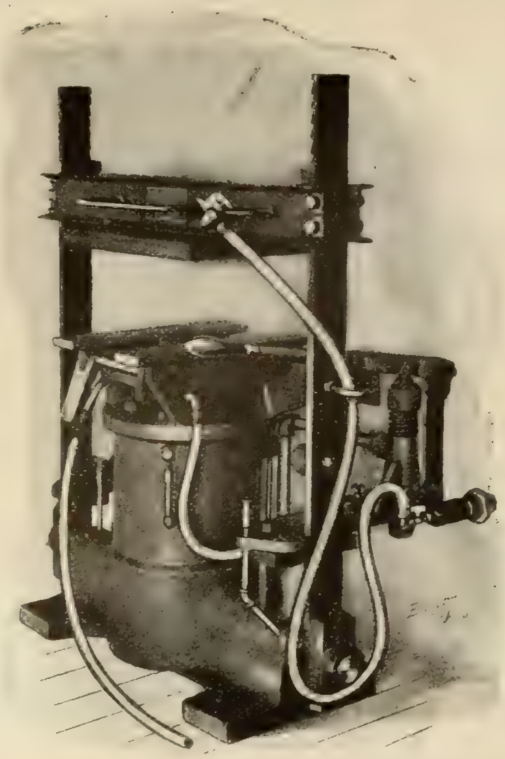

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REQUIRES THE LEAST SKILL IN OPERATION

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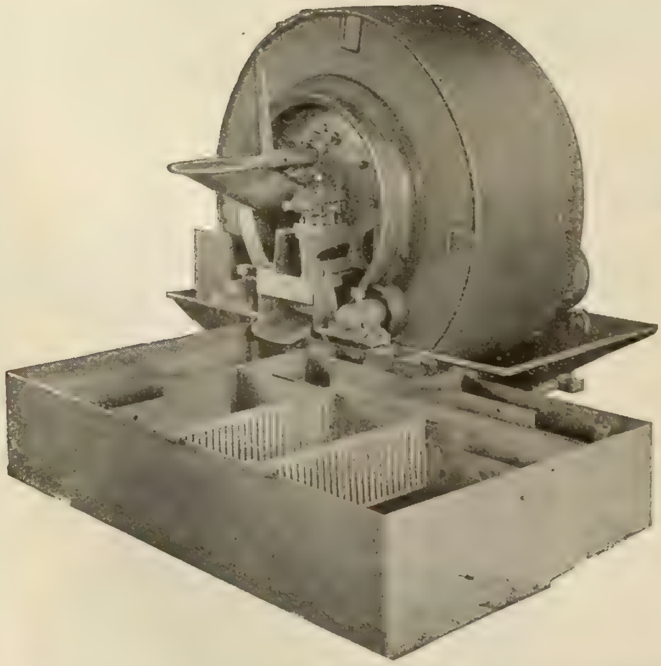

It reclaims all metal in cinders, slag, skimmings, old crucibles, etc. Built in four different sizes. Will crush and pulverize 600 to 6,000 lbs. **per hour** requiring 2½ to 7½ H.P. circulating same water over and over.

The Standard Mill is ready to operate as soon as you uncrate it. Pits under floor or special foundations are **not** needed. Lists of Canadian Foundries using it with great profit may be obtained for the asking. Write for Catalogue "C."

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XX
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Facing

Lowering the Cost of Getting Orders

THEY were talking about the high cost of getting orders—were Brown and Jones. They were agreed on some things: train service was interfering with ability of salesmen to call on as many as formerly; hotel bills were adding heavily to the weekly expenses of salesmen; congested freight and express service was interfering with quick deliveries; salaries of men were going up; labor of all sorts, as well as materials, was becoming higher-priced.

Then Brown said: "I am giving a good deal of thought to the training of my salesmen. I am endeavoring to make them produce more business—to sell more goods, and to reduce the number of futile calls. I notice that they are giving much attention to this subject in the United States, and that in Canada some firms are paying serious attention to this matter of better salesmanship."

"What are you doing?" said Jones.

"Well, I haven't done a great deal so far, for I am in the initial stages of my studies. But one thing I have learned: it is that my men haven't been analyzing the causes of their failures to make sales. I can't blame them, for I myself haven't troubled myself to dig into this phase of the selling game. Now I am asking myself and my men—Why the failure to get the order?

"I have discovered a good deal. One thing is that my men haven't known enough about the goods they took out to demonstrate them convincingly. This is largely our fault. So we are using time and printed matter to make our men know exactly what they have to offer.

"Another thing we have had impressed on us is that our men haven't been approaching their prospects always in the best way. They have been too keen to sell rather than to serve.

"I saw a thing the other day that is good—by a man named Casson. He said the average salesman's method was "Talk—Argue—Compel.' As against this, he recommended: Listen—Agree—Oblige.

"What he means is that the salesman must get on the side of the buyer if he is to have best results. And so I am doing something to get my men trained to acquire the point of view of the man they canvass—this first. When a salesman postpones his sales talk until he has won the interest and attention of the prospect, he is in a much more favorable position to put across his proposal.

"I read recently an advertisement of the FINANCIAL POST in which it told of Frank Mutton, President of the International Business Machines Company, in which he said that he has subscribed to THE POST for each of his salesmen in order that they may be well informed about business conditions and affairs in Canada—this as an aid in making sales. The idea, I infer, is to make his men quick to get the point of view of the men they are to canvass—to become possessed of a kind and amount of information which will enable them to make themselves interesting to prospective buyers of time-recording machines.

"Now, I have known Mutton for many years—known him to be a super-salesman. In subscribing to THE POST for his salesmen, I saw one of his methods—secrets, if you like. So I got THE POST myself to see how my men could make use of it for the same objects.

"I have subscribed to THE POST for 4 months at the cost of a dollar per salesman, and I have been having my men report to me in writing just how they are finding The POST useful to them. They read THE POST with one question uppermost: What item or article in this issue can be used by me to help me make sales?

"I want to tell you, Jones, that I am delighted with the experiment. The minds of my men have been stimulated. They are "cashing in" on what they read. They relate certain items or articles to certain prospects, and they are approaching their customers with greater confidence, greater art, and with more persistency, born of a surer knowledge of how our product is worth the other man's consideration and purchase.

"My men are bringing in more business, and this offsets the increasing costs of going after business."

* * * *

A VERY suggestive conversation, is it not? The point of its reproduction here: If you think the idea put into operation by Brown (and Mutton who is paying for 50 subscriptions for men in his employ) is worth your consideration, then investigate THE POST for yourself. Instruct us to send THE POST to you that you may investigate it from the angle—What is there in this paper that my men can use to help them "get next" their prospects with a view to making more sales and in quicker time?

So we suggest to you that you sign the coupon below.

Just what does the FINANCIAL POST aim to do? The answer is: It gives business men information about every important happening in every part of Canada as this happening relates to Business. It follows the various listed and unlisted securities, and gives each week clear and accurate and up-to-the-minute information about them. It tells about the movements and influences affecting such groups of investment interests as Iron and Steel, Textiles, Milling, Pulp and Paper, Transportation, and so on. It has numerous contributed articles of first-class interest and importance. It contains much personal matter—notes and sketches about men of influence or position in the public eye whose doings or sayings have relation to Business. Withal, THE POST is extremely readable. It is edited and prepared by trained journalists—the highest-priced staff of men on any publication in Canada. All this makes THE POST a "different" paper, and a good one. The subscription price is $3.00 (52 issues—Saturdays); or 4 months for one dollar.

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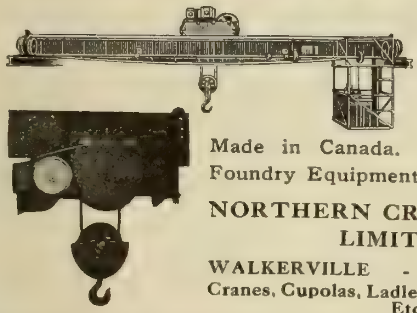

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with the results in your core-room?

Perhaps you have never investigated the merits of a good Vent Wax.

BUFFALO BRAND Vent Wax is used almost universally to vent all kinds of cores.

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Put up on octagon cardboard spools with the "Buffalo" imprint.

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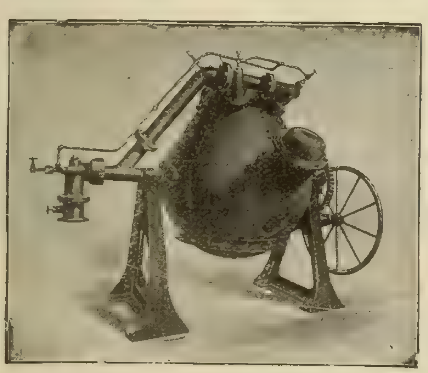

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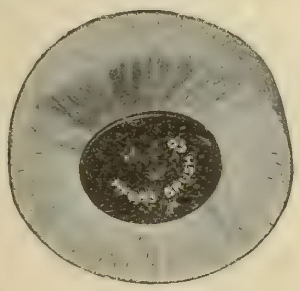

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For MAY

Canada at the Peace Conference

THE British Empire will have a representative or representatives at the Peace Conference. The question is—Who? Who will be Canada's choice? Will Canada have any part in that conference of momentous import? H. G. Wells, one of the greatest writers of the age, has written on the subject of who is to represent the Empire at the Peace Conference. He has written this article for MACLEAN'S MAGAZINE and it appears in the May issue. (Mr. Wells parcelled this manuscript and addressed it himself, for MACLEAN'S MAGAZINE.)

How Does a Retreating Army Behave?

GEORGE EUSTACE PEARSON tells how in the May MACLEAN'S. Mr. Pearson is a Princess Pat man, and was gassed at St. Julien. He is now lecturing for the American Government in Texas and elsewhere. He is a Toronto man, and his war stories are of sensational interest. The **Saturday Evening Post** has published two of his stories, and other American magazines will. Mr. Pearson is well known to readers of MACLEAN'S MAGAZINE, and this wonderful contribution to the May MACLEAN'S will be read with intensest interest. Mr. Pearson is a wonderful delineator of war.

Robert W. Service in the May Number

Service is perhaps Canada's best known poet. He is at the front, and ever since going there two years ago his verse has been appearing in MACLEAN'S MAGAZINE—a fine compliment to Canada and MACLEAN'S. In the May number he has a stirring ballad—"The Twa Jocks"—great stuff!

Stephen Leacock is There, Too

Mr. Leacock likes MACLEAN'S. He is loyal to Canada. He gives to the Canadian people the children of his fancy—and he makes this gift through MACLEAN'S MAGAZINE. "May-time in Mariposa" is his contribution to the May MACLEAN'S. Lou Skuce illustrates it.

A. C. Allenson has a Story

MR. ALLENSON is another Canadian whom the editors of American magazines appreciate, and show their appreciation by buying his stories. Mr. Allenson remains loyal to MACLEAN'S which has been his cradle, as it were. We rejoice to be able to say that we shall have many stories from this Canadian short-story writer. His story in the May MACLEAN'S is "Drop Behind and Lose Two"—amusing and tender. W. B. King, a Saturday Evening Post illustrator, has made the drawings that accompany Mr. Allenson's story.

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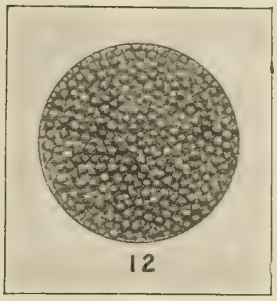

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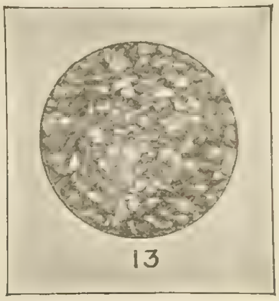

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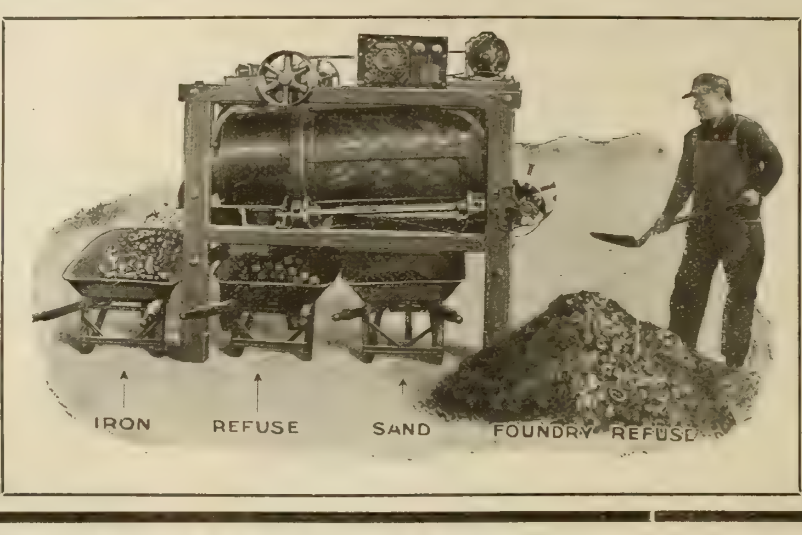

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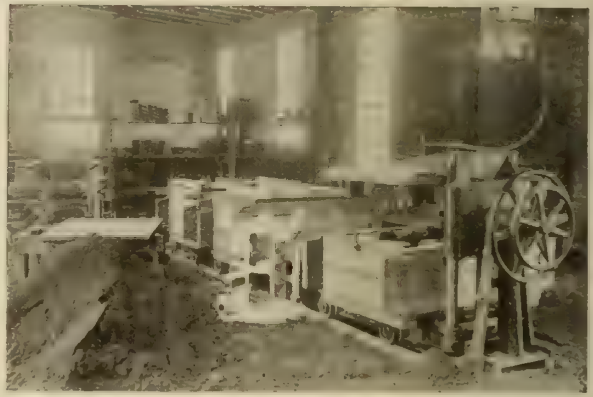

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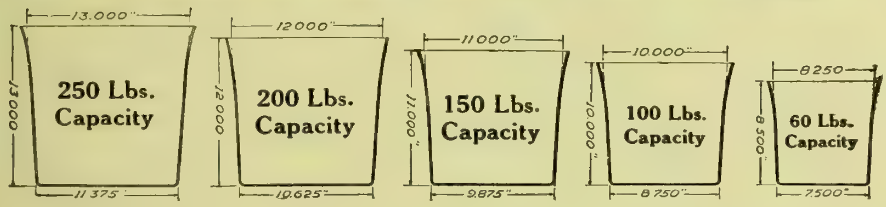
SAVE ON STEEL BOWLS and SHANKS



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200-lb. Capacity	25% to 100% increase..	4.85
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100-lb. Capacity Double End Swivel	25% to 100% inc.	13.50
150-lb. Capacity Single End	25% to 100% inc.	9.00
150-lb. Capacity Double End	25% to 100% inc.	11.15
150-lb. Capacity Double End Swivel	25% to 100% inc.	13.75
200-lb. Capacity Single End	25% to 100% inc.	10.45
200-lb. Capacity Double End	25% to 100% inc.	11.60
200-lb. Capacity Double End Swivel	25% to 100% inc.	14 25
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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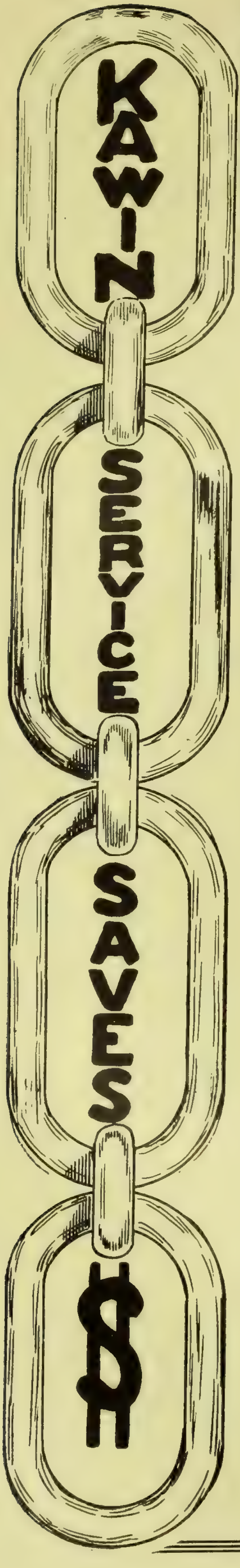

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It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

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Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont

The Publisher's Page

TORONTO JUNE, 1918

The Clear-Visioned and the Near-Sighted

IF there's one thing about advertising that would stagger you more than to know the amount of money annually spent on advertising it would be to know the amount of business produced by advertising.

¶ The latter would be truly staggering and in fact incomprehensible because it would represent practically the great bulk of the commercial turnover of the world.

¶ And yet in this age of great publicity, when so many successful firms are advertising, when the British Army was raised, when British purse - strings were loosened and belts were tightened by advertising; when Johnny Canuck used advertising to float his Victory Loan, and when Uncle Sam advertises to sell his Liberty Bonds—in the face of all this there are to-day individuals, who profess to be business men, who do not realize the power and influence of advertising!

¶ Think of it. Think of the millions of dollars being invested in advertising year after year by men who know its value. Consider the very obvious fact that advertised lines are the biggest sellers. Ponder over the fact that the proof of the value of advertising is about us everywhere, and then tell us, if you can, why some men cannot yet see the light?

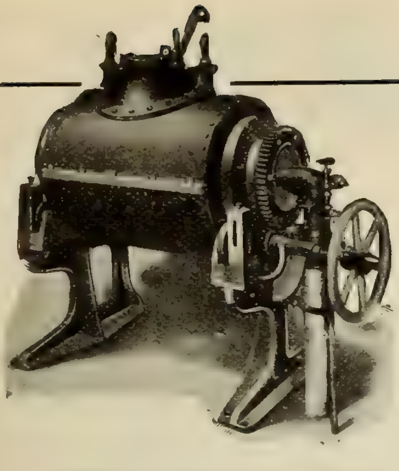
¶ They are in the woods, yet they can't see the trees. There are perfectly obvious truths in the world which the short-sighted cannot see. And the truth about advertising is one of them.

¶ Their attitude regarding advertising will influence the short-sighted and will breed in time another family of non-believers.

¶ The example of successful advertisers on the other hand will not be lost upon the clear-visioned men who are coming to the front.

¶ There will always be short-sighted men who will be victims of their own self-satisfaction. It takes all classes to make successes, near successes and failures, and all classes to make a world.

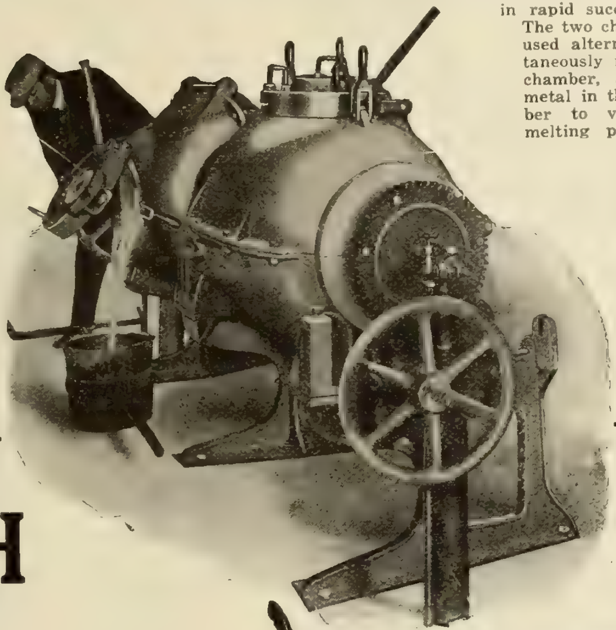
¶ It is left to individuals themselves to decide the course they'll follow.



Monarch Rockwell Single Chamber Furnace—"Simplex"—Oil or Gas.

Produces a quality of metal equal to that melted in crucibles in greater quantities in less melting time, without preparation, at a greatly reduced cost, both in fuel and labor, and entirely eliminating expensive crucibles.
For melting aluminum, brass, bronze, copper, gold, gray iron, semi-steel, etc., etc.

The Monarch-Rockwell Double Chamber Furnace



Makes melting practically continuous permitting melts of various mixtures of metals to follow one another in rapid succession.

The two chambers can be used alternately. Simultaneously melting in one chamber, and heats the metal in the other chamber to very near the melting point with one furnace, and at no additional cost.

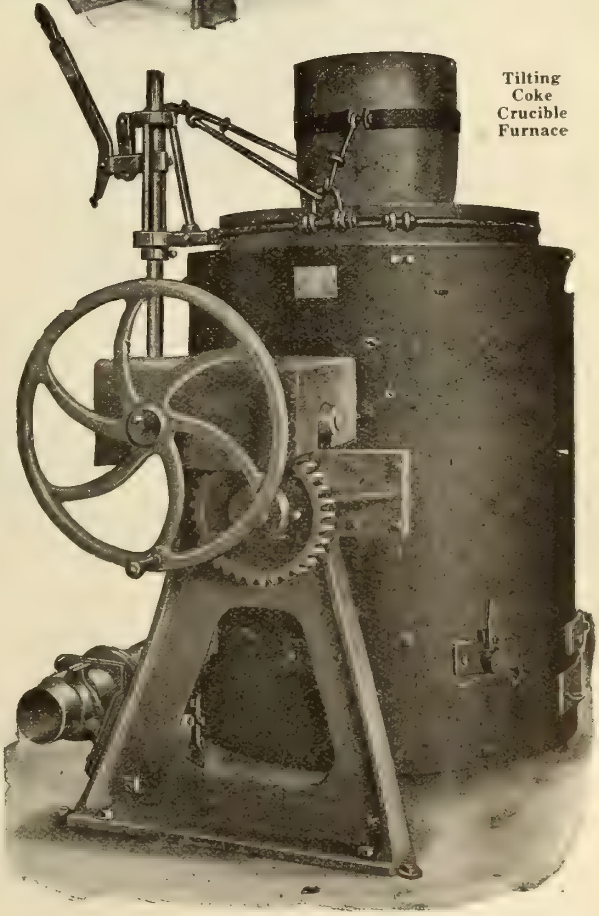
The flame is not directed against the metal, therefore, no oxidation.

For copper, brass, bronze, aluminum, iron, steel, etc. Gold, silver, etc.

MONARCH MELTING FURNACES

There is a type of Monarch Furnace for all metals, for all fuels, that you can use to big advantage in your plant.

THE WORD MONARCH ON YOUR MELTING FURNACES WILL BE THE PASSWORD TO A FASTER AND MORE ECONOMICAL PRODUCTION. Monarch Furnaces are noted the world over for their high efficiency — they **always** make good.



Tilting Coke Crucible Furnace

Hopper feed, above ground, shake grates, all size crucibles.

Monarch "ARUNDEL" Drop Front Gas or any Fuel

Monarch Core Ovens

Are hand made in any size up to 8 ft. square. They are sheet steel and are heavily lined with sheet asbestos. Cut shows Monarch Arundel drop front type. Doors can be on one side or two; any capacity; oil, gas, coal or coke fuel.

The Monarch lines are sold on the try-before-you-buy plan. It costs you nothing to test their merits.

Write for prices and full particulars.

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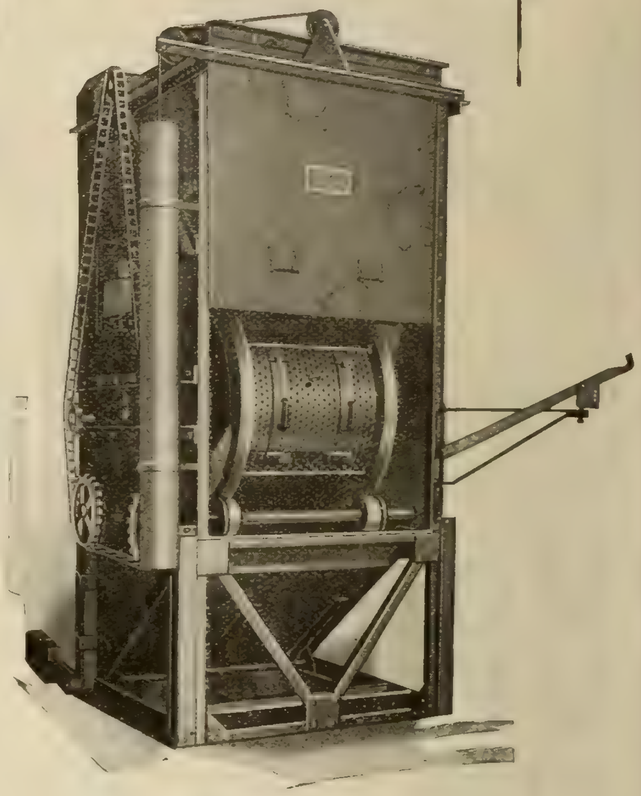
Sandblasting the Brown way is sandblasting the modern way. The Brown Revolving Barrel Sandblast Machine cleans ferrous or non-ferrous castings quickly, cheaply and thoroughly.

In these days of increased production, Brown equipment is making good by keeping the sandblasting work up to the schedule set by the rest of the foundry. No lagging behind! And that hasn't meant increased labor costs for cleaning—and it hasn't meant a lowering of the cleaning standard.

Any one of the present users of Brown Sandblast Equipment—whether on ferrous or non-ferrous work—will be glad to tell you how it is helping him keep up production, keep up quality and keep down the costs.



The Brown Revolving Barrel Sandblast Machine

The Hammer Core Machine and the Duplex Shaker are two other foundry money-makers that we manufacture.

Write for the Brown catalog and a list of Brown-equipped foundries near you.

Brown Specialty Machinery Co.

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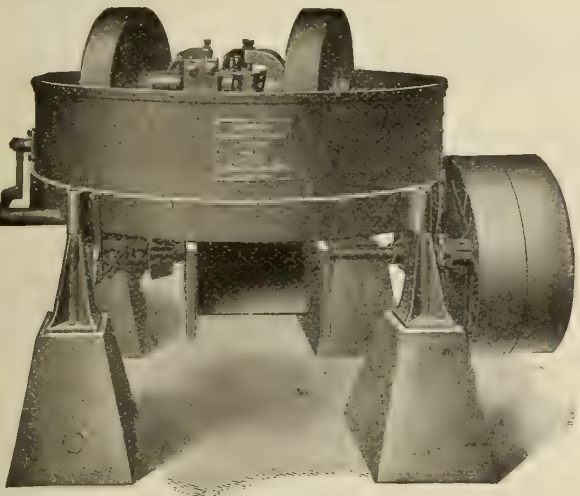
SANDBLAST EQUIPMENT

A Message to Canadian Foundries

THE SIMPSON
INTENSIVE FOUNDRY MIXER

Saves Both Sand and Labor

Improves the quality of the castings.
Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



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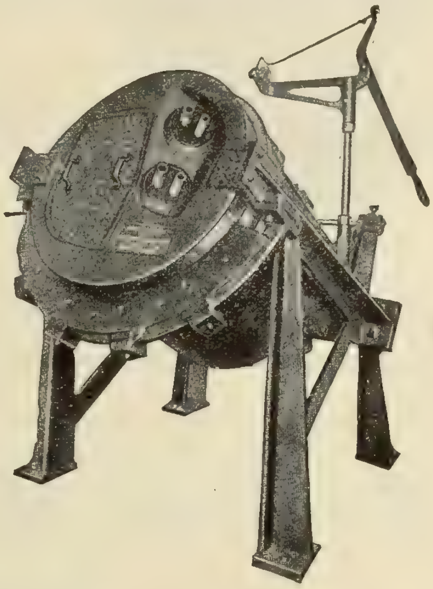

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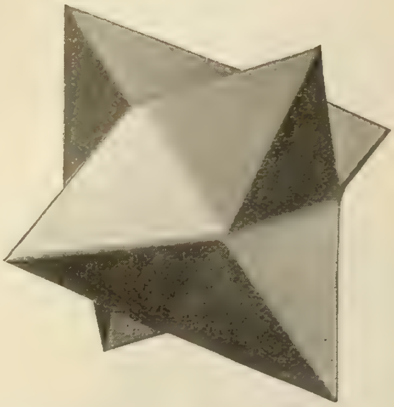

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Well built to suit rough usage.

Write for particulars to the makers.

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DON'T LOOK UPON THIS VISIT AS A VACATION ONLY—but as a straight business proposition that will repay you handsomely. Our foundrymen will treat you royally, as they are **wide-awake—progressive—up to the minute.** Bring your foreman or send him if you are unable to attend the convention to be held here October 7th to 12th.

MILWAUKEE IS ALSO A LOYAL CITY—and has oversubscribed every allotment of the Red Cross, Knights of Columbus, Y.M.C.A. and Liberty Loans—the latter from THREE MILLION TO EIGHT MILLION **over the top.** The writer has traveled more than 100,000 miles the past ten years—28,000 miles last year, and no where has he found a more loyal, wide-awake bunch of citizens than in Milwaukee.

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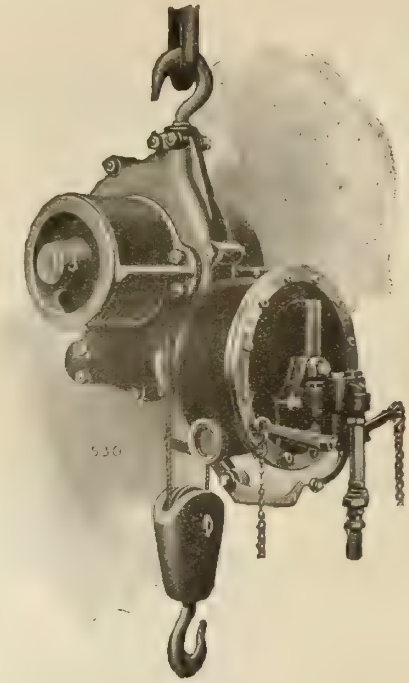

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¶ The "Imperial" Air Hoist has the simplest of motors, dust-proof construction—an important point in the foundry—strength, and lightness.

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Bulletin 8006

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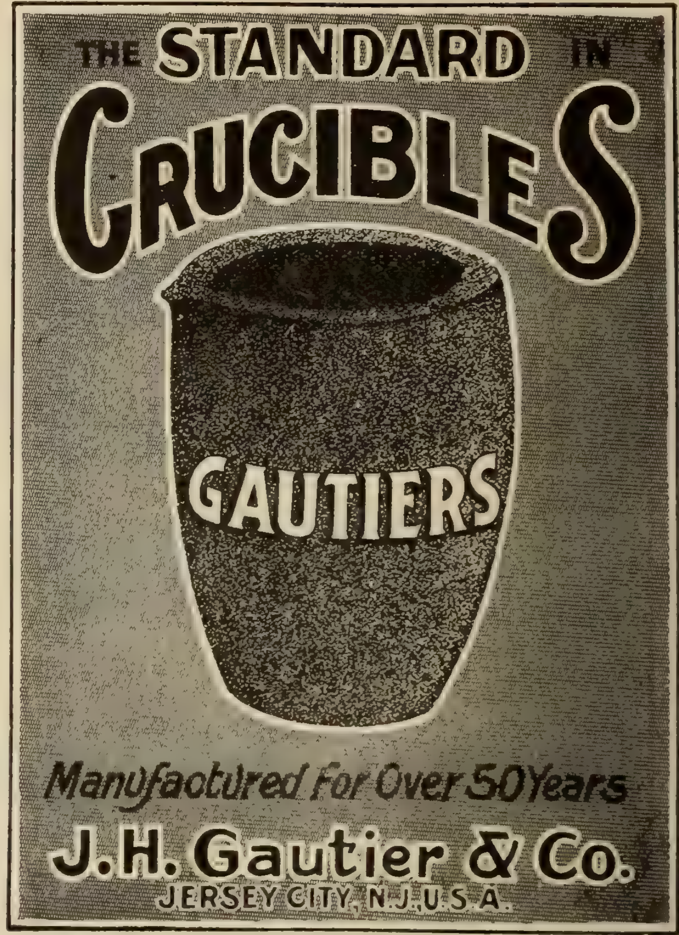

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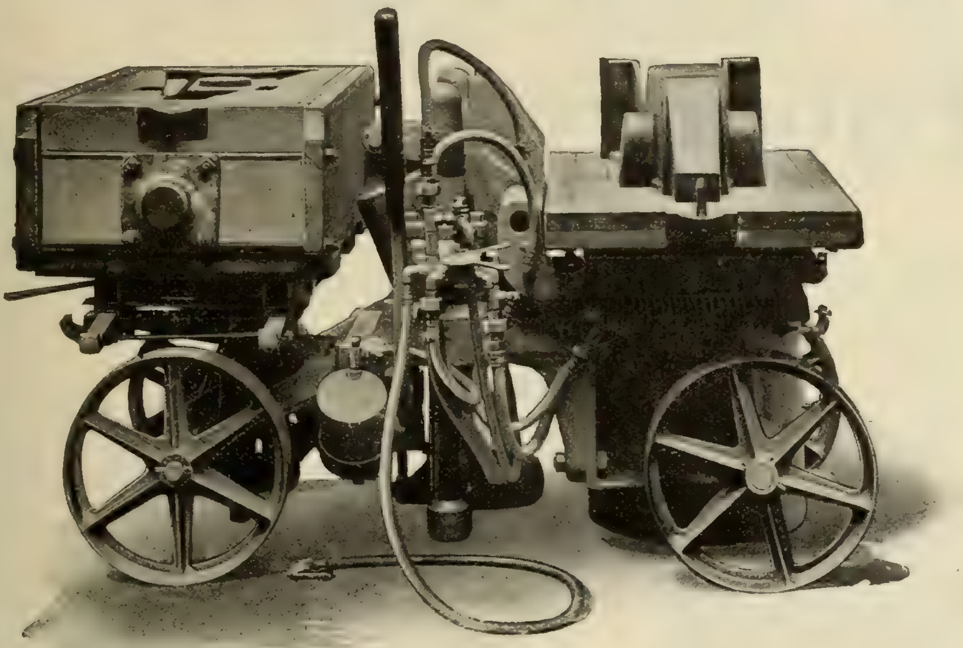

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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

The Stripping Plate Machine: Inception and Development--I.

The influence of machinery on modern production has been almost as marked in the foundry as in other branches of industry. The stripping plate machine has a long record of success and usefulness, and the following is from the Service Bureau Bulletins issued by the Committee on Foundry Methods, National Founders' Association. The details of both machines and work are clearly described and form an instructive record.

IN the year 1886, Henry E. Pridmore was working as an inventor in the experimental department of the McCormick Harvester Company and was assigned the task of making some kind of a machine that would turn out castings without the aid of skilled mechanics. His effort resulted in the stripping plate machine being perfected and coming into general use. The idea of drawing the pattern through a plate was of much earlier date, but up to this time had not been incorporated into a machine that was in successful use. So complete, indeed, was the machine made by Mr. Pridmore in simplicity and mechanical construction that one of the first machines is still in operation. Fig. 1 shows a pair of the first machines built.

The success of the stripping plate machines was due amongst others to the fact that castings could be produced in much greater quantities, while unskilled laborers could be quickly taught to operate them.

The quality of the work produced on the stripping plate machine was so superior to any produced by hand that this one thing of quality alone would have made it imperative that the machine be used. Implement manufacturers had long been annoyed by the fact that extra parts furnished by them for machines would not always fit into place but required filing and fitting by the farmer. No two moulders rap a pattern exactly the same, nor do any two ram alike, and the resulting castings had most always to be fitted into place. With the stripping plate in use it was at once found that the castings came true to pattern and that at last a way had been found to produce castings that were always duplicates.

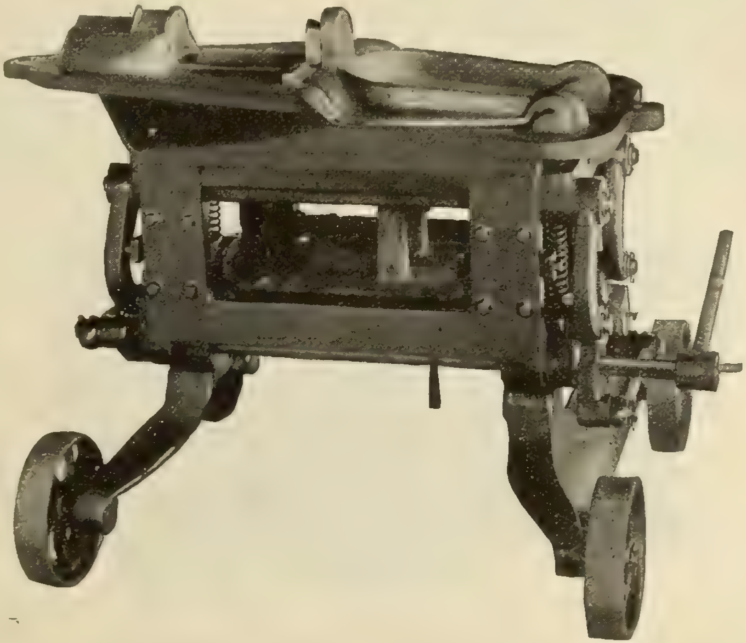


FIG. 2—DRAG PATTERN OF STEERING FORK.

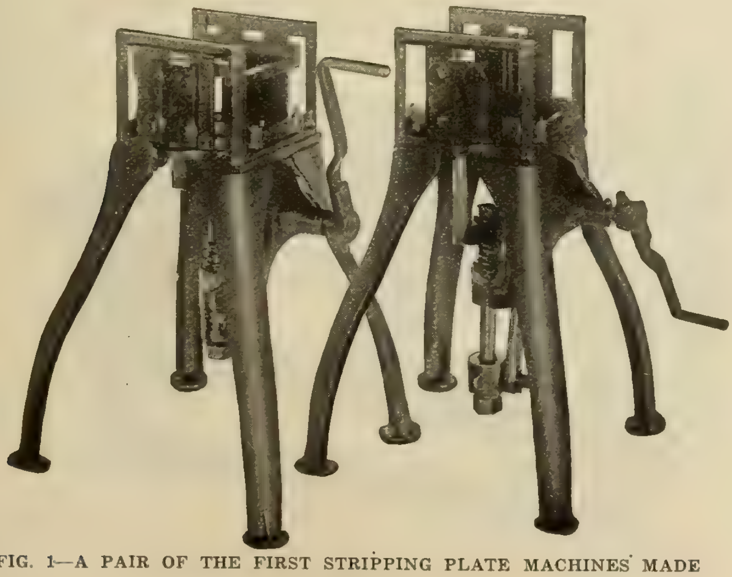


FIG. 1—A PAIR OF THE FIRST STRIPPING PLATE MACHINES MADE

Finally, the economy resulting from improved quality, greater production and the employment of unskilled men was so great as to be almost unbelievable. Selecting fifteen patterns made by the McCormick Harvester Company at that time the reduction in cost of moulding by using the stripping plate machine was 75 per cent. It is true of the stripping plate machine that they were gradually adopted by the more progressive firms and to-day you can scarcely visit a foundry that has not at least one pair of stripping plate machines in its equipment and many large foundries turn out 90 per cent. of their castings on them.

The stripping plate machine consists of a strong stiff frame, having two or more sets of adjustable guide ways in and near the top of the frame, on which the stripping plate is supported, while in the base of the frame and at a comparatively great distance from the upper guide ways there is a single, centrally located, brass bushed guide way. This construction gives in effect a long rigid guide way, in which the yoke carrying the pattern or patterns is raised and lowered by means of a depending connection, crank, shaft and lever, or by a single lever. The crank shaft is journaled in a long brass bushed box, either cast with or firmly secured to the bottom of the upper frame.

The yoke is held in its highest position, in which the sand is rammed in the flasks, by a crank pin passing slightly beyond the centre and striking a stop, or by some similar locking method.

The simplicity of the machine is one of its greatest points for to-day there is no type of machine that requires less care and that costs less to maintain than the stripping plate machine. When once the patterns are properly made, mounted and matched the stripping plate machine is always ready for operation.

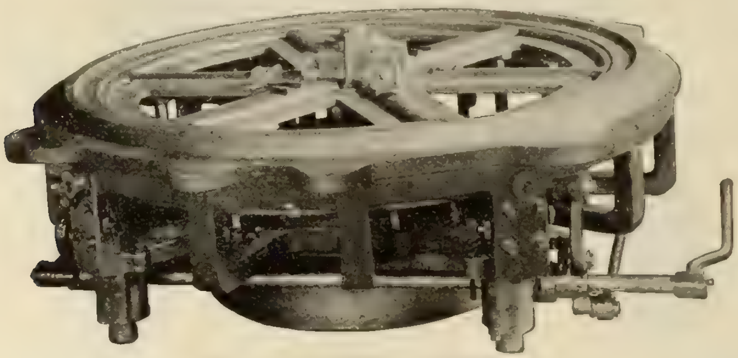


FIG. 4—FLY WHEEL PATTERN.

Stripping plate machines are built with open end frames so the pattern can extend over the machine for a reasonable distance. See Figs. 2 and 3. For this reason it is a good plan to arrange patterns in classes according to the width and depth of draw and plan so that one pair of machines will take care of as many patterns as possible.

This cannot be done with round machines (Fig. 4) as the frame extends all around the machine and the diameter of the machine is the largest diameter of pattern that can be accommodated.

The plain stripping plate machine performs only one operation in the making of a mould, that is, to draw the pattern from the sand. This is done accurately, however, and there are no broken edges to patch and no tool work should be permitted. If the mould does not come perfect fix the machine and pattern so it will.

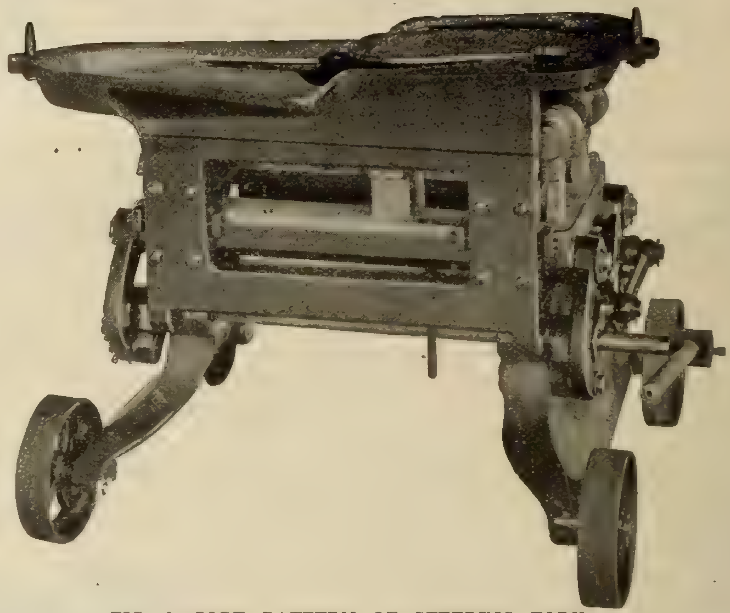


FIG. 3—COPE PATTERN OF STEERING FORK.

As much depends upon what is usually termed the "rigging" as upon the machine and pattern, so a great deal of study is necessary to have the flask, gate, sprue, crane, hoist, bail, etc., as nearly perfect for the job in hand as can possibly be done.

Flasks

The matter of flasks is a vital one for upon the flask depends largely the success of the job.

The flask should conform as nearly as possible to the shape of the pattern, so no surplus sand will have to be rammed. It should have the joints machined true so it will not rock on the plate and they should be absolutely interchangeable. Binding pins or loose fitting pins must not be tolerated. The flask must fit the machine without the slightest movement and when rammed with sand, it must be lifted off without the pins binding or sticking in the slightest degree. All flasks should be provided with a sand strip or lip around the joint edge. Flasks that require bars should have careful study so that the bars may be so placed as to support any body of sand that is nearly cut off and lacks support. If the flask is properly barred, in nearly every case the use of "soldiers," gaggers, nails, etc., will be unnecessary. The bars must follow the contour of the pattern and should come to about one inch of the pattern and joint. If the bars come too close to the pattern it makes "tucking" necessary to prevent soft spots under the bars. The drag must be barred as well as the cope. In making an iron flask that has bars it should be

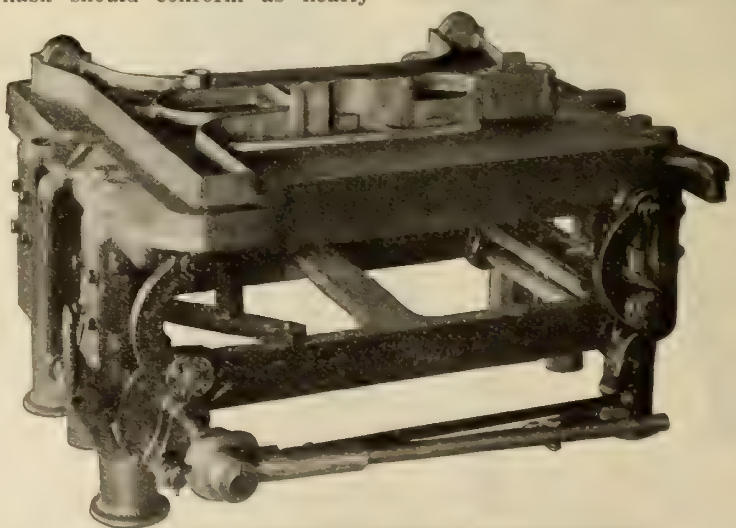


FIG. 5—DRAG OF MACHINE FRAME PATTERN.

moulded so the joint of the flask is the joint of the mould, coping down to the bars. If made in this way the sand will naturally wedge into the spaces between the bars and if turned over to shake out the sand comes out without any effort. The flask will not crack so easily if the corners are rounded instead of square.

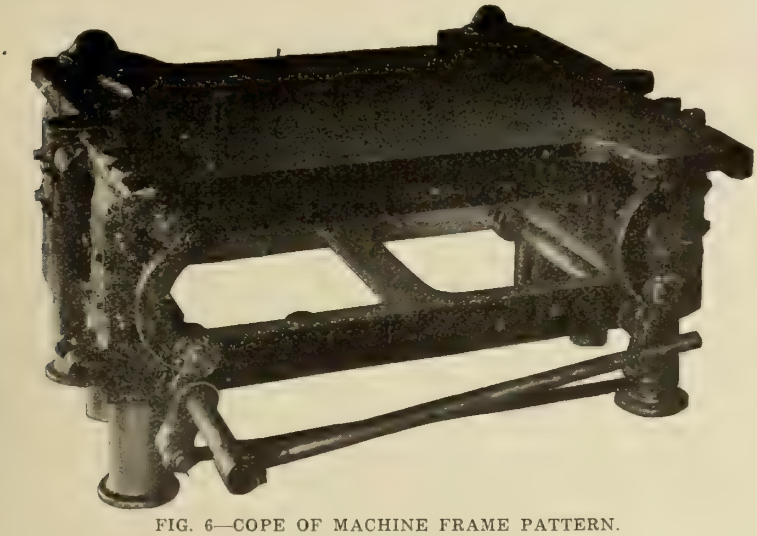


FIG. 6—COPE OF MACHINE FRAME PATTERN.

The Gate and Sprue

The gate should be made of metal and carefully fitted to the plate and against the pattern so no sand can get under the gate or between the gate and pattern.

The sprue should be made of metal, preferably iron or brass and of proper size and shape and so designed to make the sprue and pouring basin in one. When drawn out, the hole should be clean way through the cope and the sand should be well rammed all around the basin and sprue. A good way to insure a sprue hole that does not have to be blown out or cleaned is to drill a ¾-inch hole completely through the stripping plate where the sprue sets.

Turn down the bottom end of the sprue for a distance of 1 inch to ¾ inch diameter, leaving a square shoulder where the sprue sets on the plate. This method leaves a hole that does not require reaming out, and it will be perfectly clean. It takes time to set each cope on its side and clean and blow out the sprue hole.

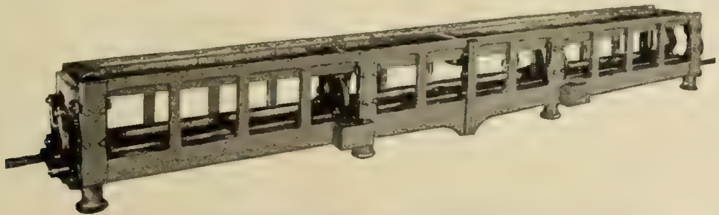


FIG. 8—A FOURTEEN-INCH BY FIFTEEN-FOOT MACHINE.

Time is also saved if the top of the sprue is a little way below the top of the cope flask so as not to interfere in striking off. The use of a sprue stick into the end of which is driven a piece of wire nail and extending 2 inches above the flask is a very crude and expensive sprue for a stripping plate job.

(To be continued.)

MAKING GREATER STRIDES

By J. E. Cooley

Across the twenty centuries reaching down to the present day, we know that the human race as a whole has never measured up even to the slightest degree of its possibilities; that men still live and die in primitive surroundings, in huts, in hovel-like structures as in times past; that few living beings aspire to the highest progressive state that it is possible for each one to reach. The distance which we have progressed thus far, it was possible to arrive at a hundred years ago; and it is possible now to so energize ourselves, as to, in the present time, attain that state to which, a hundred years hence, mankind will have then advanced.

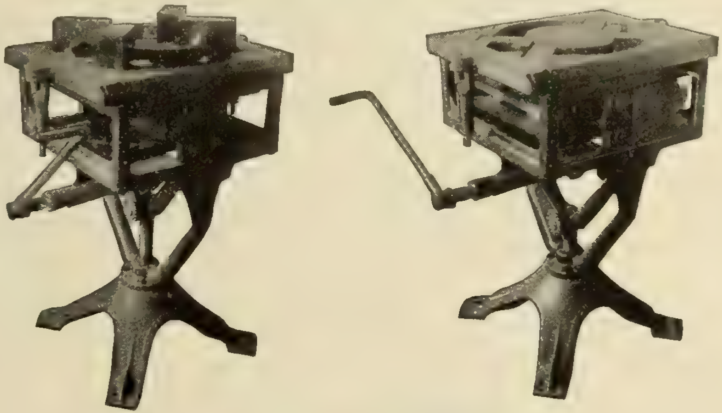


FIG. 7—STAND MACHINES.

Our great drawback is our blind indifference, our disinterestedness and neglect to do what pertains to our betterment and our own human good. Our boastfulness far exceeds our accomplishments, and much time is wasted and spent in preparing to do the things that we never even begin, or least of all never finish. We tend toward a don't-care, undefined sort of individualistic growth. We fall easily down on each job. We lack the gripping force to make what we do count in any extraordinary degree. A little exertion tires us. A little sweat on the forehead wilts us. It is not of any particular consequence that man should labor by the sweat of his brow. But his sweat, his perspiration, should emerge from every pore in his body.

Do We Profit By Experience?

Oh, for a race of alert human beings, A race of which we could be honestly proud! A class of mortals that no age has even dreamed or thought possible! We step into each new day, leaving behind us the yesterdays in which we have lived; forgetting all we have thought and talked about in the day before; coupling little or making no connections with what we have experienced and planned; in a word we die daily, we drag out of one day into another. The mudfly is born at sunrise and dies at sunset, and we would follow the same course, but for a fortunate circumstance of our natures we are given a longer duration of existence. But nevertheless, we in vast numbers fulfil no greater office than the mud-fly. For the reason that our inaction and the unprofitableness of our forgotten yesterdays are going to be repeated in our to-days and to-morrows.

A man should be so developed, so strong, and so energized, that he should be capable of making greater strides of such constructive ability as has never hitherto been displayed by any known type of human mortal. His scope of action should be extended beyond the mere drivelling, monotonous tasks he pretends to be daily doing. He should with apparent ease handle a hundred irons in the fire. His reach should outstretch a hundred miles instead of that number in square feet. Instead of one small vicinity he could be ruler of a hundred. Instead of being one human being he could be several unto himself. His capabilities, his lines of action, instead of being the stunted and half-hearted common everyday sort, could expand to proportions that might girdle the earth.

Few of us realize the great encircling distance of this globe on which we live and move and are capable of acting. We have not even yet begun to train our imagination to the point of realizing the things of earth and sky, from where we stand in our present surroundings. We make little effort to penetrate in any clear searching manner the big things of life. Nor do we attempt to dissect down to the smallest detail the things that concern us most.

The Need of the Hour

It is just this penetrating power, this dissecting process, that we are so much in need of in the present hour. It is utterly useless to make any attempt to undertake any particular task, if we do not know beforehand exactly what we are to do; if we have not beforehand carefully planned it all out, putting detail beside detail, moving things in a thoroughly progressive order without deviating one iota from our prescribed course.

A great deal is said about concentration. Concentration is, or it may be likened to, some little shifting free acting molecule that has its abode in the brain of each one's cranium. Innumerable attempts have been made to hold it steadily in place to serve one's purpose, to keep it composed and directed on some particular aim or task. But too often does it deflect or wander off away from that on which it is attentively needed. And it is for this reason that we fail to carry forward from one day to another, or from hour to hour even, our feeling of energy, of enthusiasm, and pursue steadily onward the task we have it hand.

We all admit that lagging and laziness exceed the pushing power contained in each one of us. And this is because we have not practised to any great degree how to make our actions or efforts more stable. That is, we have not cultivated more steady staying power in ourselves; more rhythm in our movements; overcoming tiredness with tirelessness; being brief and short and sure-hitting in place of our present state of lagging, dragging and uncertainty.

EXTRUDED METAL

By M. L.

Metal wire and rod made by the extrusion process is coming more and more into common use. For many years wire and rod have been made by the drawing process in which the metal is pulled through dies, successively reducing its diameter or shape. Volume of production was limited at first by the time consumed in attempting to reduce the wire too much at one draft, which resulted in pulling the metal apart, and in the frequent annealings necessary to soften the wire.

By the extrusion process the metal is pushed through the die while quite hot, thus overcoming at once the two limiting conditions of wire-drawing. The wire does not break because it is pushed through the die, and it does not get hard because it retains its softening temperature during the extruding. The process has been used in producing lead wire and lead pipe for a number of years. The problem of extruding lead, however, presents very few difficulties, as the softness of the lead allows it to be forced through the steel die cold.

For lead extrusion, the necessary equipment consists of a multiple plunger pump, a hydraulic accumulator, and a hydraulic press with attachments. Briefly these attachments consist of a heavy steel cylinder with a die-holding arrangement on one end, the other end being open to form a close fit to the plunger or ram of the hydraulic press. In extruding lead wire, a larger piece of lead is placed within this cylinder and the press started. Lead wire will flow continuously from the hole in the die until the ram reaches the end of its stroke; it is then withdrawn for a new supply of lead. During the two strokes of the ram there occurs no break to the lead wire, the second supply of lead welding perfectly to what remains of the initial charge. In producing lead pipe a long arbor is used, the point of which enters the die in such a way as to form a ring-shaped nozzle, which determines the cross section of the pipe.

Recognizing the possibilities of this process, experiments were made with the object of producing brass rod and wire by the extrusion process. Difficulties at once arose. It was found that to secure desired results all the metal must be quite hot during the extruding, that hydraulic presses of great power were necessary, and that dies suitable for lead extrusion would not withstand the temperatures essential to successful results. These difficulties have, however, been overcome and a number of firms are now making brass rod by the extrusion process. A valuable feature of this process is the practicability of extruding the brass through odd-shaped dies to form certain cross-sections very expensive to obtain by other methods.

COPPER

By M. E.

Copper is distinguished from all other metals by a peculiar red color which has a pink tinge on the fresh fracture of the pure metal. Copper takes a high polish, but does not retain it on exposure to the air, becoming coated with a film of carbonate of copper (verdigris). Ordinary commercial copper is more or less porous, and its specific gravity varies between 8.2 and 8.5. Copper possesses great hardness and tenacity, and is at the same time so ductile that it can be rolled and drawn into thin leaf and wire. By hammering and rolling at ordinary temperature it becomes harder, but regains its malleability when heated to the melting point of tin. Its melting point is about 1,990 deg. Fah. Molten copper is very fluid and has a beautiful sea-green color. Below its melting point it becomes so brittle that it can be broken into small pieces and pounded to powder.

At high temperatures under the oxy-hydrogen blowpipe it is volatile and burns in the air with a green flame. The most important property of copper is its high conductivity for heat and electricity and one of its most important uses is the electrical industry, for which purpose it must be very pure, because minute quantities of impurities impair the conductivity. With cast copper the modulus of elasticity is less than when in the form of wire; in this state the tenacity is about 9 to 12 tons per square inch, but after rolling this is increased to from 15 to 18 tons, and by wire drawing to 30 tons.

Copper is unchanged in dry air at ordinary temperature; and whilst it is coated with verdigris when in the damp air, heated to redness in air it becomes covered with a greyish layer, black in color, of cupric oxide, so-called copper scale, which is easily detached by bending the copper and quenching it in water. Copper is not attacked by water free from air or by limewater, but in the presence of air it is oxidized by water containing alkalis, acids or salts. It is easily soluble in nitric acid and boiling sulphuric acid; dilute sulphuric acid only dissolves it with free access to air. It dissolves slowly in hydrochloric acid. It has the greatest affinity for sulphur of all metals, and it combines with that element very rapidly. Copper forms two series of salts: the cupric and cuprous. The former are stable salts at ordinary temperatures; they are mostly soluble and give blue or green solutions: the latter are more stable at high temperatures; they are mostly insoluble or are converted by solvents into cupric salts and metallic copper.

Copper ores are very widely distributed. Native copper occurs in various parts of the world, and is largely worked in the Lake Superior region, yielding a pure metal, output being about 70,000 tons yearly. Cuprite, red oxide of copper, occurs crystallized and massive in Cornwall, Siberia, Cuba, Australia, etc., and contains as a maximum 88 per cent. of copper. Redruthite, copper glance, occurs native in Cornwall and elsewhere; it has a semi-metallic white appearance and is easily scratched with a knife. It contains 80 per cent. of copper. Copper pyrites, yellow copper ore, is distinguished by its golden yellow metallic appearance, and is softer than iron pyrites. When pure it contains 34.6 per cent. of copper, 30.5 per cent. of iron and 34.9 of sulphur; it is, however, usually mixed with a large excess of iron pyrites, and does not contain more than 10 per cent. of copper and often less. It is the principal English ore of copper, and is found in Cornwall, Devonshire, Russia, Sweden and in various places in the United States. Blue malachite is of a deep blue color, and generally occurs with green malachite. It is found in France and contains about 55 per cent. of copper. Tinorite, black oxide of copper, is found in large quantities in Chile and Australia, generally very impure. Other ores are cupreous iron pyrites, alacamite, grey copper ore, and green malachite.

Pattern Making: Economical and Efficient Methods

By M. H. Potter

The pattern shop is in many cases the connecting link between the engineering and manufacturing departments of an industrial plant and thus affords opportunity for effecting economies in plant processes, which enhance the pattern shop itself if judgment is used.

ONE of the first places in which to begin the work of economy and efficiency is the pattern shop. In most instances this department offers more opportunity than the machine shop or assembling and designing departments. As a matter of fact this department has been somewhat overlooked and naturally the methods of procedure can be greatly improved upon.

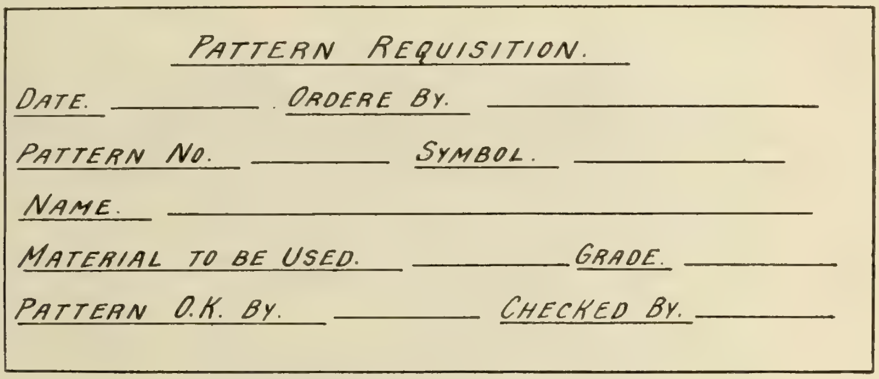
The workmanship should be kept to a high standard, the lumber used of course depending upon the number of times the pattern is to be used; patterns from which few castings are to be made can be produced from a second grade lumber and with a little less labor in their construction. Any patterns made for constant use should be of the better grades of pattern lumber. Patterns which are to be used but once can be cheaply made. The lower grades of white pine is good enough for cheap patterns and pine of the better quality is adapted to the better patterns. Mahogany is used to advantage in making small size patterns and in facing larger patterns.

Principal Points

The proper allowances for machining and shrinkage should be given careful attention. In order to prevent unnecessary cost due to machining and finishing the pattern must receive consideration. Although changes can be made in the pattern after a casting has been machined such alterations are expensive and by the proper forethought can be avoided. As a rule the draftsman is not familiar with all the conditions in the foundry and machine shop. It is up to the pattern maker to recommend and make such changes as will effect a decrease in the cost of moulding or machining or produce a better casting. Unnecessary expense can in this way be saved by inspection before proceeding with the work in hand.

Cheap patterns should not be classed as those made by inexperienced workmen but rather those which are intended for limited use and will only go to the foundry once or twice. Instances have occurred where the foundry when given a contract to produce a number of castings from patterns furnished have found it cheaper not to use the patterns supplied but to make up new patterns which would permit of not only quicker moulding but less castings. All this must be taken into consideration, as it is in the early stages of the work that great savings can be effected.

Such opportunities for saving in this particular department have led many of the larger and more progressive manufacturers to assign one employee to this work and by his efforts endeavor to eliminate the waste of time and materials in incorrect pattern making. He must not only be familiar with the most advanced methods of pattern making, molding and machining, but also in close contact with the design and requirements of the product. A man of such knowledge, provided he is one with practical experience, will effect not only a saving in time and labor but also delay. A proper uniformity of castings will be secured, and unnecessary stock, meaning a reduction in weight, and correct designs will prevail. The loss of castings due to cracking, which causes a delay in production will be practically eliminated, as most any of the ordinary troubles can be avoided by proper supervision in the pattern shop.



PATTERN REQUISITION.

DATE. ____ ORDERE BY. ____

PATTERN NO. ____ SYMBOL. ____

NAME. ____

MATERIAL TO BE USED. ____ GRADE. ____

PATTERN O.K. BY. ____ CHECKED BY. ____

FORM 1.

Checking

The checking of patterns by the drafting department is something that should always be done; although this is ordinary routine in any large shop, many of the smaller ones do not adhere to it strictly. The only practical way to determine as to whether or not the proper allowances have been made to produce the desired casting is to carefully check the pattern. If this is not done the pattern maker soon becomes aware of the fact, and knowing that his work is not checked soon becomes careless. A careful inspection of the pattern before it goes to the foundry will expose any weakness in the design and thus save a loss in the foundry. It will enable the foundry to produce a more perfect casting at a lower cost. Many minor details in the design which would increase the cost of molding by decreasing the percentage of perfect castings can be altered or eliminated.

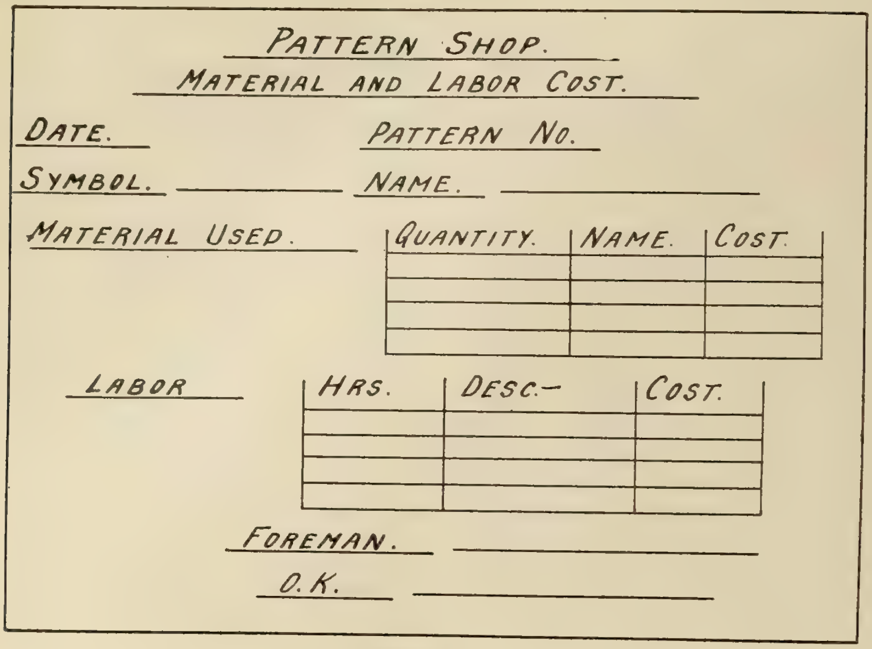
The governing feature as to what class of pattern is to be made will be the number of castings required. If the number is small a skeleton pattern will meet all the requirements, then again the castings may not turn out as expected and the pattern wil be redesigned. It is best therefore especially on work in connection with a new design, to limit the outlay as much as possible until it is determined that the results are satisfactory. A considerable amount of knowledge is required in most cases to tell from a drawing as to which is the best way to undertake the work. When a man of such skill can be secured his salary is a secondary consideration, as he is in a position to effect a great saving of both time, labor and delays.

Many manufacturers of a stock product rely upon interchangeability to secure economy and eliminate complications. The various parts of the pattern, whenever practical, are made so as to be interchangeable. In core making particularly is a great saving made.

Machine Equipment

Special labor-saving machinery is another great help to the pattern maker and a cost decreasing element. In fact labor-saving machinery of this type is practicall yessential; without it patterns cannot be made in an economical way. Its use enables boys at a low rate to turn out first class, satisfactory work in less time than the experienced pattern maker working by hand can do it. Of course, such help requires a certain amount of training and familiarity with the various machines used. The up-to-date pattern shop has its special machine tool equipment the same as the tool room or the machine shop, that is if reduced labor costs are an important requirement.

In order to secure good results and prevent delays the foreman pattern maker and the inspector must keep in close touch with the drafting, foundry and machine shop departments. This co-operation will enable them to know exactly what results are being obtained and where the trouble and delays are. Success cannot be attained to any great extent unless this is made a practice of. By seeing the results of his work the pattern foreman is enabled to shape his endeavors and those of his department to secure the results wanted. On the other hand the inspector is in a like position and can do away with the repetition of errors and delays. This is especially true in shops employing a majority of unskilled help and depending upon the special machine equipment to make up the deficiency.



PATTERN SHOP.

MATERIAL AND LABOR COST.

DATE. PATTERN NO.

SYMBOL. NAME.

MATERIAL USED.

QUANTITY.	NAME.	COST.

LABOR

HRS.	DESC.—	COST.

FOREMAN.

O.K.

FORM 2.

Routine Forms

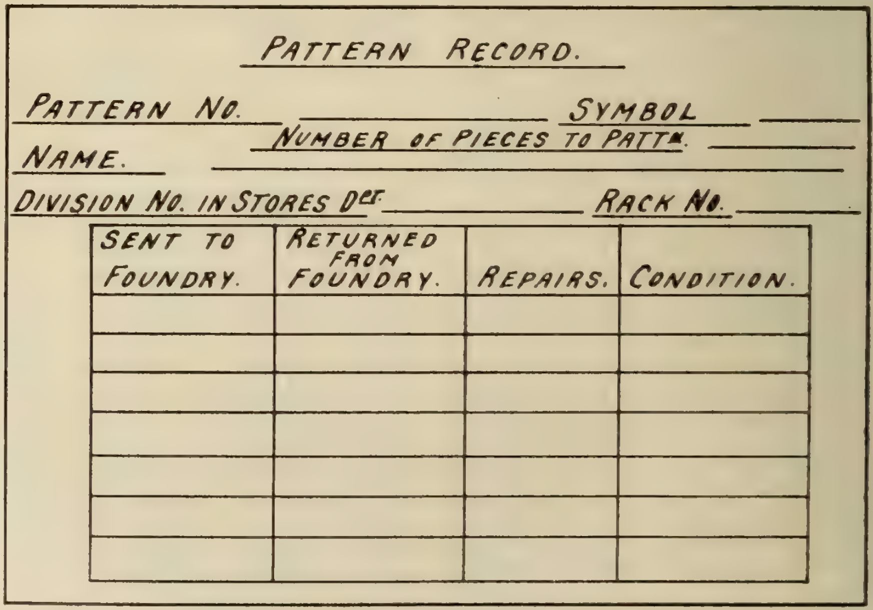
A pattern requisition form as illustrated in Fig. 1 or a similar form has found favor with a number of concerns. It is self-explanatory is made out in part (material to be used and grade) by the pattern inspector. By this method no unnecessary expense is made in patterns.

The material and labor cost form shown in Fig 2 is essential; by referring to same the accounting department can determine the actual cost of the pattern. The symbol number is the machine or apparatus number to which it is a part.

Although the pattern record form is of minor detail, see Fig. 3, it enables the interested party or department to know exactly how many times the pattern has been to the foundry, the number of castings made, the condition and the repair work necessary. It also enables immediate location in case of alteration or inspection. As any other records are valuable for reference, for fixing costs and estimating purpose, so are these pattern records which are easily kept at no great cost.

While red tape is far remote from most pattern shops, the introduction of a certain amount of system and supervision would not be wasted in this particular department. Especially when the underlying principles and elements mean so much to the results finally secured and the costs involved.

A close investigation of many pattern making departments in well managed and seemingly efficient organizations would no doubt make certain the fact that should the patterns be purchased outside the cost would be considerably less. Not only in the cost of the pattern itself is this true, but in the molding and machining. I know of one instance where a concern effected a saving of 15 per cent. in their pattern cost by having their patterns made by a concern who made a specialty of pattern making.



PATTERN RECORD.

PATTERN NO. SYMBOL

NAME. NUMBER OF PIECES TO PATT.

DIVISION NO. IN STORES DEP. RACK NO.

SENT TO FOUNDRY.	RETURNED FROM FOUNDRY.	REPAIRS.	CONDITION.

FORM 3.

Purchasing Patterns

There are two methods of purchasing patterns, namely on contract and on an hourly plus material basis. If the former is to be employed the duties of the inspector are most important and the need of a man possessing a broad knowledge of pattern making, molding and machining from a practical standpoint is self evident. The hourly plus material system lends itself more readily to this work and when, as in any line or work, a reliable concern is employed, the results obtained are most satisfactory. It stands to reason that the company which specializes in one line of work can become most expert at it and can afford to install up-to-date machinery and keep abreast of the times. To those unable through volume of work to keep a pattern making department busy at all times, such a concern means a great saving.

The storing of patterns and the keeping of a record to locate them is very important. It avoids the making of a new pattern, and will in some instances through alterations avoid the necessity of making another pattern. The system used varies greatly with the nature of the business engaged in, but by careful study and consideration the patterns can be grouped so as to be easily and readily located.

Owing to the fire risk and more so to the vigilance of the insurance inspectors the pattern shop is generally kept clean and frequently swept. However a saving could be made in the majority of cases, if a closer watch was kept over all waste lumber. It should be a duty of the sweeper to sort and keep all nails, etc., found in the sweepings.

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AN alloy for bearing metal, recently patented in United States, consists of two parts by weight of copper, one of antimony, and smaller percentages of lead and nickel. The antimony is to give the hardness and the nickel toughness. For high speed dynamo shafts of steel the following alloy is given:—4 Cu, 2 Sb, 1 Pb, 1 Ni. The bearings do not require any lubricant.

Dominion Steel Foundries, Ltd., Have Done Much to Solve After-War Problem

When Munitions Orders Fell Off In Fall Of 1917 Move Was Made To Take Care Of Capacity Of Open-Hearth Furnaces — Developing A Line That Has Previously Been Imported

THE Dominion Foundries and Steel, Ltd., of Hamilton, have to a large extent anticipated their after-war problem. When the first break came in munitions orders in September of 1917 the officials began to investigate other lines to which their plant could be turned. They decided there was a good chance for the making of agricultural shapes, plow standards, etc., and at once turned to develop these and kindred lines. The business has now gone past the experimental stage. It has been a success, and as yet it is in its infancy.

Growth of the Company

The company was organized in 1912 as the Dominion Steel Castings Co., C. W. Sherman being the organizer and chief executive of the new concern. In the following year, 1913, the new firm became amalgamated with the Hamilton Malleable Iron Co., and then took the name Dominion Steel Foundries. In 1916 the Hamilton Steel Wheel Co. came into existence, and the year following another amalgamation was completed, taking in all the above under the firm name Dominion Foundries and Steel, Ltd. At the present time it is the holding company for the above-named corporation, and will eventually become the operating company as well.

TWO HIGH PLATE MILL AND ROPE TRANSMISSION.

The Officers

The officers of the Dominion Foundries and Steel, Ltd., are as follows:

President—C. W. Sherman.

Vice-President—W. J. Verity, Brantford.

Secretary—A. G. Wright.

Directors—C. W. Sherman, W. J. Verity, J. J. Harty, Kingston; S. A. Crone, New York; Robert Hobson, Hamilton; Paul J. Myler, Hamilton; W. E. Phin, Hamilton; E. H. Ambrose, Hamilton; F. A. Sherman, Hamilton; A. G. Wright, Hamilton.

Rapid Development

Cold figures sometimes are quite effective in telling the story of growth and development. When work was started in Hamilton there were 100 men employed. To-day the firm has between 1,700 and 1,800 working in the various factories under its direction. When C. W. Sherman organized the Dominion Steel Castings, Ltd., in 1912 it was the intention to go into the manufacture of steel and malleable castings, but the malleable business was never developed, the main product being steel castings for locomotives and cars and special lines for railway equipment.

Munitions Business

The company has had signal success in the development of the munitions industry, having been interested in various stages of the output. It was in April of 1915 that they turned out the first 4.5-inch shell blanks and their first shrapnel. Since then, up to September of 1917, the output has been large, rejections few in number, and results very satisfactory. In that time they machined shrapnel, 4.5, made shell blanks for 4.5, 60-lb., 6-inch, 8-inch and 9.2-inch; forged 6-inch, 8-inch, and 9.2-inch. The sole work now is on 6-inch shell blanks and forgings, which are being turned out at the rate of 100,000 per month.

Opened Plate Mill

The management could see that in time the munitions business would cease, and the next problem was to secure an outlet for their open-hearth capacity. Not long after the Dominion Foundries and Steel had their plate mill in operation the embargo was placed on the exportation of plate from United States. This gave the Hamilton mill a very favorable position early in its career. Other lines were affected by the embargo, and the Hamilton mill began the manufacture of plates for railway cars and automobile frames, as well as the agricultural lines. The initial installation consisted of one mill, the success of which was sufficient to justify the installation of duplicate equipment.

Product

The product at present being turned out consists principally of agricultural steel for plow standards, land sides, shears and discs, etc. The plate rolled at this mill is also suitable for conversion into diaphragm plates and automobile frame steel, tire steel for farm tractors, etc. The steel is all of high grade quality and made to any analysis, as required for the different purposes for which it is to be used. The plates are rolled from No. 15 gauge to ¾-inch thick and any width up to 24-inch. The company was in a particularly favorable position to embark on a venture of this description, as the ingots from which the plates are rolled are cast in the foundry adjoining, which had been in operation for some years. The plate mill thus became a branch of the company's regular business and at the same time is indicative of the extended activities which have been undertaken in recent years. The company has embraced an opportunity of manufacturing a product not hitherto made in this country, but one for which there is an extensive demand. The management believe that they are in a position to supply the entire agricultural machinery trade in Canada with the product such as they are now manufacturing.

Plant Layout

Construction of the mill building was commenced early in July last, and such good progress was made that the first shipment of plate was made on October 25 last, and it is interesting to note that the shipment in question was made to Tien-Tsin in China. The building is 168 feet by 197 feet and adjoins the company's main plant. The building is of steel construction and arranged in three open bays. The first bay contains the furnaces, the second the mills and ingot floors, while in the third are located a number of shearing machines of different types. Tracks from the steel foundry run into the middle bay for delivering ingots to the floors near the furnace, the ingots being handled inside by the means of a Shaw 10-ton, electrically operated, overhead travelling crane, having a span of 60 feet. Another crane of the same type operates over the third bay, serving the shearing machines and plate piles, also used for shipping finished plate, all of which is shipped from this bay by a railway switch running parallel with the building.

BATTERY OF OIL-FIRED INGOT HEATING FURNACES IN PLATE MILL.

Furnace Installation

The furnace installation consists of three ingot-heating furnaces, one combination pair and sheet furnace and a large annealing furnace. The ingot furnaces each have a hearth surface of 120 square feet and the annealing furnace has 500 square feet of hearth surface. All the furnaces are oil fired, the oil being delivered under pressure to the furnaces, where it is mixed at the nozzles with air at a pressure of 50 lbs. per square inch. The charge in the ingot furnaces ranges from 15,000 to 18,000 lbs. each. The heat varies according to the carbon content of the steel.

The annealing furnace has tracks on the hearth, upon which rests a set of cast iron balls carrying a cast iron cradle capable of holding 20 tons of sheets or plates. After being in the furnace for a time the sheets are then taken out and remain in the box about twenty-four hours and allowed to cool slowly. The combination pair furnace is really a sheet mill proposition, but can be used for the lighter gauges of plate. It is so constructed that the waste heat from the pair furnace passes over a brick arch, and is used again in the front or sheet heating end in connection with the annealing process. In the rear end the charging doors are at the side, whereas in the front furnace the doors are at the front. There is an overhead runway from the ingot furnaces to the mill to facilitate the handling of the ingots.

Rolling Mill

The mill is a two high plate mill, the installation consisting of three stands of rolls and a cogging stand. The roughing rolls are 26 in. by 60 in. and the finishing rolls 26 inch by 38 inch and 26 inch by 32 inch respectively. The ingots are carried from the furnace to the roughing mills and broken down. The steel passes through the roughing rolls on to a large table known as a lifting table, which is operated by air pressure. The table rises, elevating the steel, which is then passed back over the top roll to be put through the mill again. This operation is repeated several times when the steel is transferred on an electric transfer buggy to the finishing mill, where the plate is given the proper gauge and surface. During the breaking down operation great care is taken to remove all scale which forms on the steel. The reduction in the roughing mill is provided for by a screw-down arrangement electrically driven and controlled by the operator, who has a dial in front showing the relative distance between the rolls. The mill is driven by an electric motor through a rope drive.

TRIMMING SHEARS, HOT SHEARS AND STOCK PILES.

Mill Transmission Details

The mill is operated by a Bullock electric motor through a rope drive of the American type, supplied by Dodge Mfg. Co., Toronto. The motor is a 500 h.p., 2,200 volt A.C. machine, operating on Hydro power and of specially strong construction for mill work. The motor is situated in a room adjacent to the transmission, and to the left of the mill. This drive is an interesting sample of rope transmission. It is an endless rope of Manila, 2,800 feet long and 1¾ in. diameter. The rope feeds from the under side of the extreme left-hand groove in the smaller sheave round the idler and back to the top of the sheave on the opposite side, then across to the big sheave. Each sheave has 28 grooves. The motor and smaller sheave run at 380 revs. per min., the big sheave at 120 revs. per min., and the mill rolls at 32 revs. per min., the gears in the mill line providing for the necessary reduction in speed.

Shearing Machinery

The plates after passing through the finishing mill are placed on a cooling bed. They are then carried to the hot shears and cut into lengths. This machine is a Long & Alstatter, motor-driven gate shear, having 60-inch knives and capable of shearing stock up to 1 inch by 20 inch cold. The plates after being cut to length are sheared into blanks and into various shapes into machines equipped with specially designed knives. There is also installed a gate shear for trimming light gauge stock. This machine has 126-inch knives, and was built by the United Engineering Co., Pittsburgh. Shearing for agricultural stock requires skilled labor and special knives to suit the work.

Pickle Department

The pickle department is located in a separate building, which is situated so as to allow immediate loading of the steel in railroad cars for shipment as soon as the pickling process is completed. The pickling house is equipped with a 2-ton overhead electrically-driven crane and industrial tracks, etc. No agricultural steel is pickled, but all automobile frame steel is treated, the process con-

SHEARS FOR AGRICULTURAL STEEL, ALSO SHOWING STOCK PILES.

sisting of thoroughly cleaning in a sulphuric acid bath 7 per cent. solution, and afterwards covering the steel with a coat of lime to prevent rusting. The company pays particular attention to the quality of steel used in the manufacture of the finished product, and has been successful in producing a fine quality steel, particularly suitable for the purpose for which it is required. The quality of the steel is claimed to be better for its purpose than any manufactured on this continent. T. L. Crossen, who is superintendent of the plate mill, has been in charge since its inauguration. Mr. Crossen has been engaged in plate mill work for a number of years, and came from Pittsburgh to take charge of this plant.

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ACID-RESISTING IRON

FOR many years chemists and metallurgists have been seeking some form of metal which could be adapted for the requirements of the chemical industry for the purpose of resisting the corrosive action of acids, but it is only in comparatively recent years that there has become available acid-resisting iron suitable for large chemical plants.

It has long since been proven in the laboratory that a pure form of iron could be rendered resistant to either sulphuric or nitric acid by the addition of a suitable proportion of silicon, chromium or other elements, but according to S. J. Tungay who discussed the matter recently before the Society of Chemical Industry in London, Eng., the development and application of such metals upon an industrial and commercial basis was not approached until some twenty years ago.

Foreign Efforts

In Paris, Jouvre successfully made small castings and in Germany "neutraleisen," so-called, was produced by more than one metallurgical house for producing castings to withstand nitric or sulphuric acids, but the firms which took it up did not meet with commercial success. In more recent years the development of the electric furnace had proved a valuable aid in the satisfactory commercial production of such alloys as ferro-silicon and ferro-chromium. Kowalke, in America, had made considerable research, and his tests showed that silicon present in a lesser quantity than 12 per cent. did not promote satisfactory resistance to corrosion, whilst, when it reached 19 per cent. or more, the acid resisting quality of the alloy again fell.

In addition to the serious difficulties presented by the considerable shrinkage of non-corrosive iron castings during cooling, which amounted to slightly over ¼ in. per foot in each direction, as compared with a shrinkage of about 3-32 in. per foot in the case of ordinary cast iron, the presence of graphite in any considerable quantity caused disaster. The iron must also be low in carbon and phosphorus, otherwise during the process of cooling these compounds tended to separate out and form eutectics. Some tests recently made at the Manchester School of Technology showed these eutectics to consist largely of phosphorus and silicon. These difficulties, however, had been largely overcome by suitable furnaces and by improved manipulation in mixing the metal, with the result that in present commercial practice it was found quite possible to produce a satisfactory acid resisting iron, but its application to the manufacture of large plant for the chemical industry had not until recently been completely successful.

The physical constants of acid-resisting iron compared with cast iron are as follows:

	Cast iron.	Acid resist. iron
Density	7.3	6.8
Tensile strength (tons per sq. in.)......	9-10	6-7
Melting point	1150 deg. Cent.	1200 deg. Cent.
Hardness	24	35
Heat conductivity..	10	8
Electrical resistance	8	10
Contraction per foot in casting......	3/32 in.	9/32 in.
Crushing 1 in. cubes	40 tons	34 tons

Since the outbreak of war, acid-resisting iron has played no small part in the construction of plant for the production of propellants and high explosives. For the condensation of nitric acid, it was found to be a great boon, as plants of large capacity had to be erected rapidly at short notice, and it was found possible to instal many large nitric acid plants of this class of iron much more rapidly than would have been the case with pottery, as was more usual. In addition it was found that that acid-resisting iron possessed a much higher efficiency owing to its greater heat conductivity than earthenware. The heat transmitting power of acid resisting iron had been calculated at ten times that of stoneware or quartz, and thus the parts could be made much smaller. A condenser built of acid-resisting iron condensed a charge of nitric acid in sixteen hours, as against thirty-six hours with a similar condenser built of pottery. The metal was now being used for other purposes, including the concentration of sulphuric and other acids.

With all this success there were still difficulties to be overcome. All alloys of low silicon content, say, 10 per cent., were attacked very readily by the acids mentioned, and while acid-resisting iron which contained from 16 to 18 per cent. was satisfactory from the resistance to acid point of view, it was so very hard that it was impossible to machine it in any other way than by grinding with high-speed abrasives.

Apart from chemical plant, this iron had a wide application for anodes in connection with electro-metallurgical processes. On the outbreak of the war it was impossible to obtain magnetite anodes, since they were chiefly made in Germany, and a substitute was found in acid-resisting iron.

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PRODUCTION OF MINERALS IN 1917

IN a preliminary report on mineral production in Canada during 1917 John McLeish, B.A., chief of the division of mineral resources and statistics, points out that it is customary to express the total mineral production and to make comparison of production in different years in terms of dollars or total values.

On this basis of record and comparison the total value of the metal and mineral production in 1917, as shown in this preliminary report, was $192,982,837. Compared with a production in 1916 valued at $177,201,534, an increase of $15,781,303, or 8.9 per cent., is shown, while compared with a production in 1915, valued at $137,109,171, there is shown an increase of $55,873,666, or 40.8 per cent.

It must not be inferred, however, that because such a large increase is shown in the value of our mineral production, that our mines and quarries have actually increased their tonnage output at the same average rate. In fact, an examination of the record will show that the quantities of many important products were considerably less in 1917 than in 1916, and over two-thirds of the increase in value is to be attributed to coal, gypsum and cement, in which the quantities marketed were less than in the previous year.

The interrelation of industry is shown by the effect of a diminished coal and coke output on the metallurgical production, the falling off in production of copper and gold is in part attributable to this cause. Lead and silver also show much smaller output. As against these decreases there has been an important increase in the production of zinc, and increases also in the production of cobalt, molybdenite, and nickel.

In 1916 the metal production showed a very large increase over that of the previous year, but in 1917 the net result in value has been an increase of only $311,387, making a total value of $106,630,752.

The total value of the non-metallic production, including clay and quarry products in 1917, was $86,352,085, as compared with $70,882,169 in 1916, showing an average increase of $15,469,916, or 26 per cent. Practically every product, with the exception of the stone quarry output, shows an increased value of production; but in the case of coal, graphite, gypsum, and cement, the quantities actually marketed were less, notwithstanding the increased values.

In representing a total valuation of the mineral production as is here given, it should be explained that the production of the metals—copper, gold, lead, nickel, silver, and zinc, is given as far as possible on the basis of the quantities of metal recovered in smelters, and the total quantities in each case are valued at the average market price of the refined metal in a recognized market. There is thus included in some cases the values that have accrued in the smelting or refining of metals outside of Canada.

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BRASS FOUNDRY OF THE ST. LAWRENCE WELDING COMPANY

EXPANSION of the brass foundry business has been a natural consequence to the abnormal and rapid development of the shipbuilding industry. The production of brass castings for engine parts and interior fittings is one of the necessary requirements incidental to marine activity, this being due to the imperative need of installations that will give satisfactory service under atmospheric and weather conditions; in addition to this artistic appearance has much to do with brass fittings for ship equipment. The heavy demand for brass and bronze castings has resulted in the development of many foundries for this purpose, some of these having shown remarkable expansion during their brief period of operation.

BRASS FOUNDRY OF THE ST. LAWRENCE WELDING COMPANY SHOWING FURNACES.

From a small beginning about the first of November, 1917, when two initial pit furnaces were installed with a capacity of 500 lbs. each per day, the brass foundry of the St. Lawrence Welding Company has shown a capacity increase of approximately 800 per cent. in less than six months, the total daily production at the present time being about 4½ tons. The output is obtained from a battery of eight 500 lbs. pit furnaces and one oil fired tilting furnace, with a daily capacity of 1,000 lbs. A feature of the pit installation is the utilization of hard coal as fuel, with natural draft, the furnaces being arranged in sets of four. The method of firing has shown a great saving over the use of coke, as the hard coal is less destructive on the crucibles.

One portion of the shop is decked over to from a small but serviceable pattern room. The firm at present are principally engaged in the production of brass castings for ships' telegraphs and other general marine work; also considerable business in bronze bearings for heavy duty engine and rolling mill work. A. M. Barry is the managing director of the company.

ANOTHER VIEW OF THE FOUNDRY SHOWING MOULDING FLOOR.

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SEMI-STEEL is considered to be a great heat and acid-resisting material since it is purer than grey cast iron. In recent tests for loss of weight under heat, grey iron lost 34 per cent. whilst semi-steel lost only 9 per cent. One direct practical advantage of this characteristic is evidenced by the demand for semi-steel bars for locomotive grates. Gears made from semi-steel frequently outwear steel gears, since the high graphitic carbon in the former acts as a lubricant. This is the greatest and most important point of difference between the two. In the case of semi-steel graphitic carbon exists in exceedingly small flakes and granules, whereas in grey cast iron the graphitic is usually present in the form of large flakes.—D. S.

Producing Sound Steel With Special Ingot Molds

The Inventor of the Gathmann Ingot Mold Advocates the Elimination of Blow-holes by Allowing the Formation of Piping at the Upper End—Many Molds of the Type Described Have Been in Use With Satisfactory Results

By Frank C. Perkins

THE accompanying illustrations, Figs. 1 and 2, show a train of Gathmann 20 x 24 x 80-inch ingot molds and a one-ton ingot made on the big-end-up mold, while in drawings Figs. 3 and 4 may be noted the details of construction of the Gathmann molds. The photograph Fig. 5 shows two ingots cast in a standard mold and in a differential mold, the former having a piping discard of 27.3 per cent. and a blow hole discard of 41.2 per cent., while the ingot cast in the differential mold shows a piping discard of only 5.17 per cent. and no blow hole discard whatever. In the photograph Fig. 6 may be seen split ingots made in Gathmann mold and also in a regular type of mold. In considering the commercial production of sound, homogeneous steel ingots and blooms, Engineer Emil Gathmann has found that there is a decided difference of opinion among the producers of steel as to what constitutes commercially sound steel.

He says: "Some metallurgists insist upon having, for certain grades of steel, a so-called "open steel," i.e., one which contains numerous blowholes of varying sizes, and consequently but little volume of true pipe, although a central intermittent shrinkage cavity often extends well down into the ingot. Such blowholes and pipe are expected to weld up during rolling or forging, because their surfaces are not oxidized. Even if this be admitted, included slag particles and a high degree of segregation are bound to be present in the product of such ingots. Blowholes are the result of an oxidized heat, and all heats, unless made or finished in the electric furnace, are oxidized more or less. Subsequent deoxidation, or rather degasification, either in the ladle or in the mold, or in both, is necessary to reduce or prevent blowholes. As is well known, a greater yield of billets or sheets is secured from the ingot by allowing the formation of blowholes, but this is undoubtedly obtained at the expense of the quality of the product. Decided segregation of carbon, phosphorus, and sulphur, as well as small included slag particles, undoubtedly exists throughout the greater portion of all so-called open steel and cannot be removed by cropping."

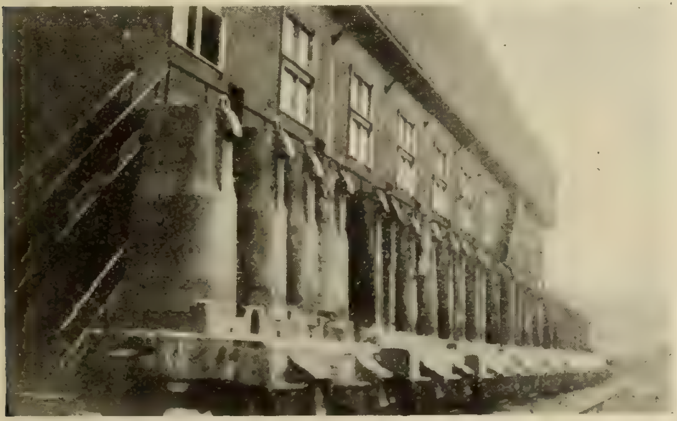
FIG. 1- TRAIN OF GATHMANN 20 x 24 x 80 INS. INGOT MOLDS.

Engineer Gathmann further maintains that "the first requisite for sound, homogeneous steel ingots and blooms is, therefore, in my opinion, so to treat the steel in the furnace, ladle and mold that "piping" steel is produced. The line of demarcation between harmful and so-called "harmless" blowholes is practically impossible to define. Is it not, therefore, the better and safer practice to use means for the elimination of blowholes and correspondingly reduce the segregation and allow the formation of a well-defined shrinkage cavity or pipe at the upper end of the ingot? With the relatively cheap deoxidizers available at the present time, e.g., ferro-silicon, aluminum and titanium, there is no commercial reason why all steel should not be thoroughly degasified."

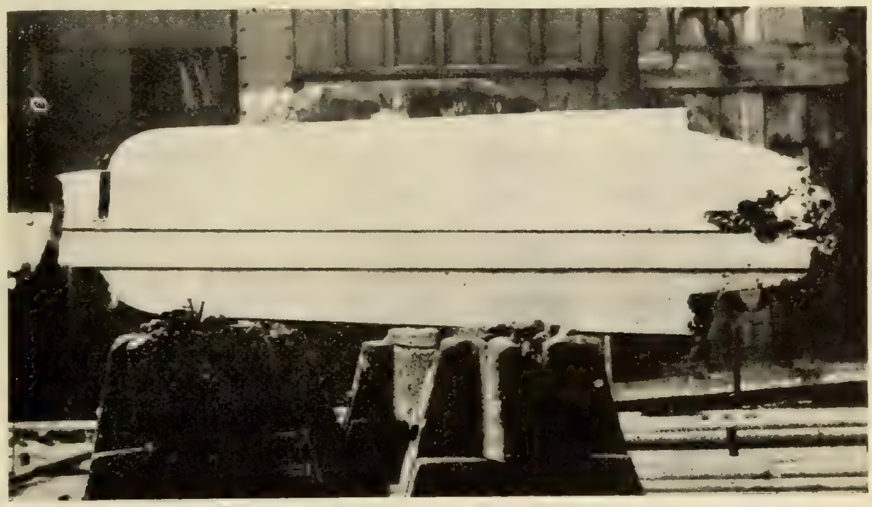
FIG. 2—GATHMANN INGOT SHOWING ABSENCE OF PIPE IN MAIN INGOT.

Theory of Mold

The inventor of these special molds claims that a degasified steel being provided, the method of freezing or solidifying the liquid steel into an ingot, and the subsequent working into blooms and thence into various products, is of great importance in reducing the crop or scrap portion of the steel, due to segregation and pipe. How to accomplish this reduction at a minimum expense and without upsetting the administrative mill practice of present plants is the problem. It has been my experience that the solidifying of an ingot made from steel which has been practically deoxidized or "killed" in the ladle or in the mold depends upon the shape of the horizontal cross-section of the ingot at its various planes from top to bottom, and also upon the thickness and consequent heat-absorptive power of the various parts of the mold walls. An ingot with its larger horizontal cross-sectional area at the top is without question the best shape for obtaining the important "lag" in solidification of the steel, and whenever such large-end-up ingot can be conveniently used, it is the best practice to do so. Nearly all of the large mills are, however, so equipped for handling and stripping the ingots that it is practically impossible to do this without extensive changes in equipment.

It is declared that it is necessary to employ means in ordinary big-end-down ingots to greatly accelerate the freezing and solidifying of the lower and middle portion of the ingot, and thus provide liquid metal to compensate for the decrease in volume caused by the contraction during solidification of the ingot. This has been accomplished by giving the lower 70 to 80 per cent. of the metallic mold in which the ingot is cast a much greater degree of heat-absorptive capacity than the upper 30 or 20 per cent. thereof.

It was attempted to accomplish this by ribbing the lower exterior surface of the mold in order to provide increased radiating area, or by water or air cooling the lower and middle portions of the mold. These earlier constructions were, however, found not to be practicable for commercial use. The desired results in differential cooling were then obtained by greatly thickening the lower and middle portions of the mold walls, consequently increasing their heat-absorptive capacity, and making the upper mold wall thinner and less heat-absorptive.

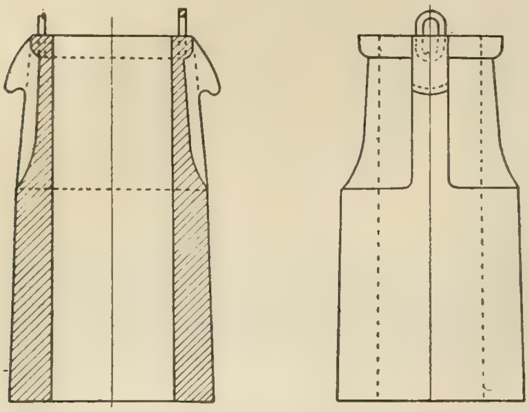

FIG. 3—GATHMANN INGOT MOLDS

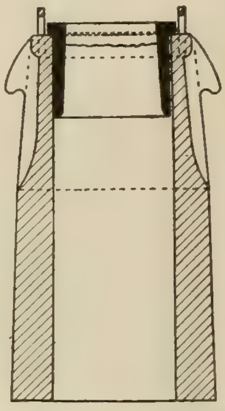

FIG. 4—GATHMANN INGOT MOULD SHOWING SINK HEAD APPLIED.

Many hundreds of molds of the kind shown in Fig. 5 have been in daily use under usual furnace and mill conditions during the past year, and designs of molds have been made and established in actual practice for from 1 to 10-ton ingots. In order to insure an ample supply of liquid steel to compensate for the shrinkage in the upper portion of the ingot in very dense, quick-setting steel it was found advisable to use walls of a material of poor heat conductivity in the uppermost portion of the mold to supplement the differential effect obtained by the combination of the heavy and thin mold walls; in other words, to provide a sink-head.

It is stated that the usual type of sink-head resting on top of the mold, or rigidly secured in the upper part of the mold cavity, was found not to fulfill all the conditions necessary in a commercial sense, primarily because of the high cost of such sink-heads when efficient. Sink-heads of this kind must be of sufficient thickness and strength to hold the liquid steel without cracking or breaking. Even a slight crack or break in the sink-head is sufficient to form a fin of steel and hang the ingot during its vertical shrinkage, thus causing surface cracks and defects in the body thereof.

Type of Sink-Head

The drawing Figs. 3 and 4 shows a method of freely suspending within the mold cavity a sink-head made of poor-heat-conducting material. This type of sink-head, in conjunction with the heavy-wall mold, has given most excellent results, and is in regular use by several of the largest high-quality steel works in this country, in conjunction with the mold walls with a heavy body and thin top. Such a mold, if properly designed, will produce a sound, homogeneous ingot with about a 20 per cent. top crop, which is about 15 per cent. less than is usually necessary in ingots of like grade of steel made in the old-type mold.

The photograph Fig. 6 indicates split ingots of vanadium-nickel-chrome steel, one cast in a mold of the standard type and the other cast in a Gathmann-type mold. With a sink-head in combination with the type of mold described the crop necessary to eliminate the pipe and segregation is approximately 10 to 12 per cent. of the cold ingot. When the ingots are allowed to solidify in the mold the pipe will be formed to its maximum depth.

A fairly early stripping and rolling of the ingot is advocated, the actual time of stripping being governed by the cross-section of the ingot and no expensive change in administrative practice is required in the production of ingots by this method, which is in use by many steel plants.

It is claimed that it may be readily incorporated in the practice of any of the large steel works without upsetting in any manner the casting or mill practice. The physically homogeneous condition of the ingot of primary importance in producing sound blooms and finished products. The method of blooming such ingots is, however, also of importance. It has been my experience that in some heating and rolling practice there is danger at times of actually forming a false pipe, or rather fissure, in the ingot. This is especially the case where the ingot has been allowed to solidify and become cold in the mold. Many mills have found it good practice to strip the mold from the ingot before its central portions have entirely solidified and place it in the soaking pit or furnace in a vertical position, allowing the temperature to become equalized and the final feeding, due to shrinkage, to occur while in the soaking pit. The ingot is then rolled while the interior is hotter and more plastic than the exterior. Great care must, however, be exercised that the ingots be allowed to remain in the soaking pit until the steel is entirely set, because rolling with any green steel in the ingot will produce spongy centres. It is therefore necessary to determine the proper heating period before pulling specific sizes of ingots for blooming.

Regarding the best method of reducing ingots to blooms, it is best to effect most of the reduction in butt-to-head passes, and a marked improvement in crop reduction is obtained by this method of rolling, especially when the piped section is confined to the upper 20 per cent. of the ingot. Irrespective of any heating and mill practice which it may be desired to use at any specified mill, the physical condition of cold ingots split open for inspection is undoubtedly the true index to the value of any method for producing sound, homogeneous steel.

Ideal Considerations

It is maintained that the theoretically ideal method of making sound, homogeneous steel is undoubtedly with the big-end-up mold, because the increasingly large area of the ingot towards the top compensates automatically for any irregularities in the temperature of the steel or in the teeming practice.

The photograph Fig. 2 shows a split ingot produced by the Gathmann method under normal conditions with the big-end-up practice, the crop for piped

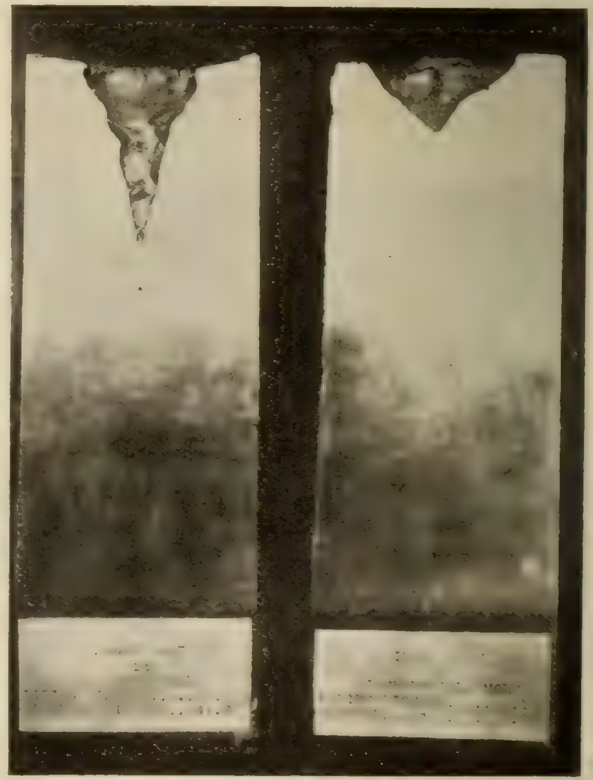

FIG. 5

section being approximately 5 per cent. The inventor recommends in the usual mill practice where cars or bogies are used for carrying the molds, the heavy-walled body, light-walled top, big-end-down mold, as shown in Figs. 3 and 4 and also the use of a suspended sink-head of non-conducting material to fully compensate for the contraction in the upper portion of the ingot.

FIG. 6.

It is pointed out that these molds and methods are applicable for the production of any grade of steel cast in ingots, and will invariably improve the quality and lessen the top crop, and thousands of tons of these molds have been made of both direct and cupola Bessemer iron, giving excellent service as to number of heats per mold, while reports from mills using these methods and molds show that an important saving has been effected thereby in reduction of crop ends, and in making good, sound, homogeneous steel for every purpose.

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MAGNETIC SEPARATORS

By M. M.

There are very few instances to be found of greater waste in workshop management being found than in the usual disposal of the shop sweepings, metal turnings and borings, foundry sand, etc. In the old days many firms considered these materials as not worth troubling about, and many instances are known where large sums of money have been made by merchants buying this material, which was considered by the manufacturers as of little value, and after treating same, disposing of it at a high profit. Competition has opened the eyes of many manufacturers to the value there is in their waste material and greater efforts are being made to recover the products. This is a necessity even in normal times, but under the existing conditions of life in this world, with the scarcity of metal, it is almost as great a necessity to recover the metals, and see that there is no waste of copper, brass and gunmetal, etc., as it is to see that no waste takes place in coal, light, and even eatable things.

The use of brass turnings and borings reclaimed from the scrap heaps of firms to an extent hitherto unknown has certainly eased the position as regards this metal. It is up to every manufacturer in the world to look round the works and see what is being sold as scrap and to consider whether it would not be worth while putting down the necessary plant to treat the materials themselves, and so save the profit which would otherwise not be theirs.

A practical instance of this occurred recently where a large works had a heap of about three tons of good gunmetal turnings containing a very large percentage of iron. They were considered as useless and a dealer was asked to make an offer for them. He offered $25 per ton, but a sample being passed over an efficient magnetic separator it was discovered that there was nearly 50 per cent. of good metal, and as the market price at that date was about $300 per ton, it is obvious what a large sum the firm would have lost had they sold the three tons at $25 per ton.

The saving made showed a handsome profit over the cost of a magnetic separator to treat just this one lot, and left them in a position to treat all future quantities and save the money they were otherwise losing in selling the material. This is by no means an isolated instance, and is only given as an example to put works managers and manufacturers on the alert to see that no such instances occur in works under their control.

In nearly all engineering works the practice in these days is to try and keep separate those shops where iron is being turned and those where metal is turned; but, however careful they may be, it is impossible to keep them separate, and there is always the danger of tools breaking and pieces falling into the metal, so that before the metal can be re-melted, it is absolutely essential that the turnings should be passed over an electro-magnetic separator which will remove the impurities and make a valuable marketable material. Further, there is often a waste of iron in foundry sand. Many firms make a practice of only riddling their sand and getting out the large pieces, but if they would go carefully over it with a horse-shoe magnet they would be very surprised at the quantity which is wasted, and they would soon cover the cost of putting down the plant.

PIG IRON FROM SCRAP STEEL

The electric furnace has made possible what may be regarded as almost a revolution in the steel industry. It is the conversion of scrap steel or iron back into pig iron. What may be called "Synthetic pig iron" is now a commercial product; in other words, the original constituents of pig iron are being made to reunite in the condition originally assumed. The new process is being applied commercially in a large electric-steel plant in the eastern part of the United States, high-grade or low-phosphorus pig iron being made directly from ordinary scrap steel. Not only is pig iron being produced in large quantities, but wash-metal and iron and steel castings are made in the same furnaces. The pig iron sells in the open market as a competitor with regular low-phosphorus blast-furnace iron, the wash-metal goes to crucible-steel makers, and the iron castings are sold to near-by users, or else are used by the company in its rolling mill.

The idea is not new, but this is the first record of its exploitation in the United States. Late in 1912, Horace W. Lash, of the Garrett-Cromwell Engineering Company, of Cleveland, organized a corporation for the purpose of converting scrap steel and iron into pig iron in an electric furnace on the Pacific coast. Pig iron being expensive in that part of the country, and the fact that it could be made by this process without the use of coke, charcoal, or coal, which are not cheaply available there, were the impelling reasons. It is not known that the company carried out its plans, but it is understood that Robert Turnbull, an engineer at one time identified with Heroult in his efforts to introduce his electric furnace in America, is now producing pig iron from scrap steel in an electric furnace in Canada.

The Eastern steel concern that has been successfully operating, as stated above, is known as the Sweetser-Bainbridge Metal Alloy Corporation of Watervliet, N. Y. For several months it has been producing from a Ludlum electric furnace. About 50 tons per day is the present output from two 5-ton furances.—*Jour, Frank, Inst.*

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FROM the point of view of analyses, malleable castings contain more silicon and sulphur but less manganese than steel, and whilst in steel it is considered advisable to keep the phosphorus under 0.06 per cent., the phosphorus of malleable castings, according to American experience, can safely be a maximum of 0.25 per cent. In malleable castings the carbon can be considerably reduced by annealing, but the silicon, sulphur, phosphorus and manganese remain practically constant. Under these conditions, says Mr. E. Adamson, in a paper read before the Staffordshire Iron and Steel Institute, only certain particular classes of pig iron are suitable for malleable castings, whilst for steel—broadly speaking—any pig iron can be used.

Application of Electric Arc Welding to Shop Uses

Staff Article

In all branches of industrial progress the initial steps in the commercial development of a particular art or science have always to be taken by a small minority of pioneers whose keenness of perception and breadth of vision have enabled them to grasp the salient facts at an early stage. The installation described in the following article is a recent example of progressive action which falls within the aforementioned category.

THE use of electricity, as a means of heating metals to the point of fusion thereby enabling different objects to be welded together, has been in existence for several years. The manufacture of welded tubes and the joining together of wire coils in wire-drawing plants were amongst the earlier applications of electric welding to manufacturing work. Such applications, however, were of a more or less specialized nature. In recent years considerable progress has been made in the development of equipment and methods of use, and now electric welding is recognized as a standard manufacturing process, capable of doing sound, reliable work in various metals. It can be utilized under all conditions and has been found to yield economical and efficient results in many widely varying fields of metal working activity.

Autogenous and Incandescent Welding

The term, "autogenous welding," frequently used in connection with blow pipe as well as with electric welding, refers definitely to the fusing together of two metals by the application of heat without pressure, while the union of two metals by means of blows or pressure while in a heated state is classed as incandescent welding. This latter class, therefore, includes butt welding and spot welding, in both of which the pieces to be united are pressed together more or less firmly, while arc welding, like blow pipe welding, relies entirely on the attainment of a temperature sufficiently high to melt the metals, so that they mix together in a liquid state and, when cool, form a thoroughly homogeneous junction.

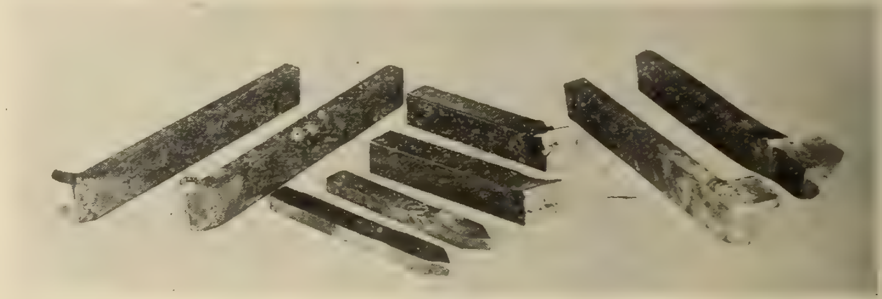


FIG. 1.—GROUP OF MACHINE SHOP TOOLS WITH TOOL STEEL TIPS WELDED ON ELECTRICALLY.

Electric welding equipment of a type and capacity suited for use on the majority of jobs met with in modern machine shop practice has been installed recently in the plant of the Hamilton Gear & Machine Company, Toronto, and has already been the object of considerable attention from manufacturers in allied lines.

The principal use to which the process has been applied by this firm is the salvaging of high-speed steel and stellite from the scrap heap. The method employed is that of arc welding scrap bits of high-speed tool steel and stellite to shanks of cheap mild steel, thus producing useful cutting tools for lathe, planer, shaper, etc. That great savings can be effected by this system is perfectly apparent.

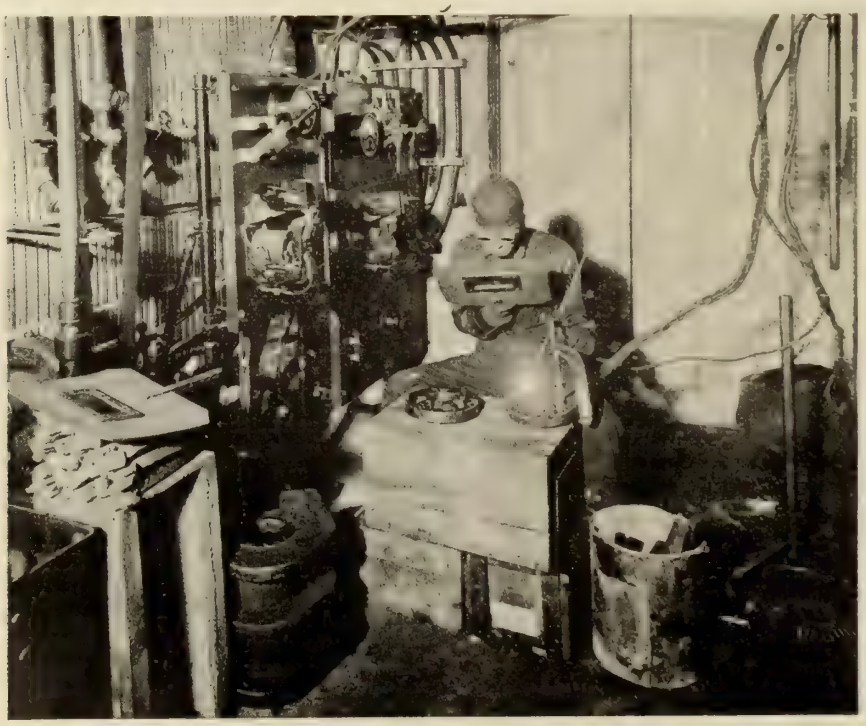


FIG. 2.—VIEW OF WELDING INSTALLATION, SHOWING CONTROL PANELS AND OPERATOR WORKING ON ARTICLES SHOWN IN FIG. 4.

The group of tools illustrated in Fig. 1 indicates the wide range of shapes possible in tools for lathe, shaper and planer work, while a special application is shown in Fig. 3, which is a profile tool for accurately forming the outline of the bevel gear blanks in the foreground. The width of cutting edge on the latter tool, combined with the large amount of overhang, produces a condition not at all conducive to the maintenance of the cutting edge, and the percentage of scrap involved after frequent grindings would be considerable. By using ordinary steel plate with a high-speed steel cutting edge of suitable proportion the cost of this tool is reduced to a fraction of what it would be if made completely of high-speed steel. The cutting edge may be renewed indefinitely and the reduced liability to fracture by vibration due to the use of the soft steel plate insures a desirable economy in upkeep.

The tools shown in Fig. 1 are of familiar types; and here again the economy of material and variety of shape obtainable are immediately apparent.

At the left is a round-nosed lathe tool ground and ready for use; next to it is a similar tool in the rough. The two flat forming tools in the foreground were four scrapped tools before welding. The two large tools in the centre and the two at the right are wide-faced tools of straight and side cutting design. In all of these the cutting edge is of high-speed tool steel selected from the scrap heap. The shanks are of cheap, mild steel.

Two Electric Methods

There are two methods of electric arc welding. One where a metal electrode is used, and one where a carbon electrode is used.

Metal electrode welding requires a wire or rod of suitable material, which forms the negative terminal of the electric circuit; the article being welded is made the positive terminal. The arc is formed by touching the work and quickly withdrawing the electrode to a distance of about 3/16 in. or less. The heat generated by the arc melts the metal at the point of application, and the electrode itself melts, furnishing the molten metal for joining or building up the welded parts.

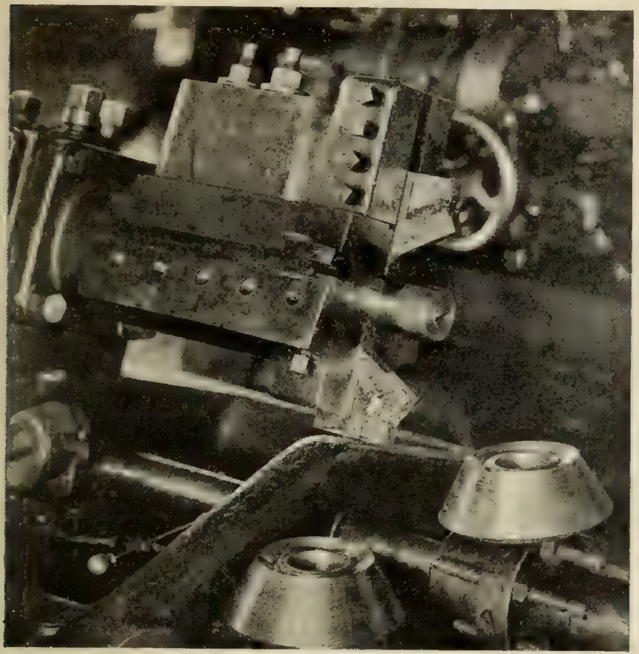


FIG. 3.—FLAT CUTTER WITH LONG WELDED TOOL STEEL EDGE, FINISHING BEVEL GEAR BODIES IN TURRET LATHE.

With the carbon electrode system a carbon pencil or rod is used for the electrode, and is made the negative terminal as with the metal electrode. The heat which can be obtained with the carbon electrode is practically unlimited, and the metal can, therefore, be melted very rapidly. In welding with the carbon electrode the filling material must be supplied in the form of a separate rod or bar.

The question might be asked: Do not carbon particles enter the weld and cause a very hard quality of iron at the joint? The logical answer is yes, but if the carbon electrode is held far enough away from the weld, particles of carbon are not carried into it, and, with ordinary care, joints which are soft enough to be machined can always be made in steel. In cast iron it is much more difficult to produce a soft weld.

Relative Advantages

The relative merits and advantages of the two processes depend on the class of work to be done. The carbon arc for average work usually requires from 150 to 400 amperes, with a voltage of from 40 to 60. The current required with the metal electrode is approximately from 60 to 100 amperes, with a voltage of from 25 to 30. A resistance is used in series with the arc in each type to steady it. Obviously, of the two methods, the carbon would lend itself better to heavy cutting or applying large quantities of metal quickly and is the more frequently used in such classes of work. The comparatively slow rate of deposit by the metallic method makes for a smoother, more uniform and better-looking weld, and hence is used in lighter service, such as general repair work, etc. The temperature of the arc with the metallic electrode is considerably less than with the carbon, and with care the metal need hardly be raised above the melting point.

Although the current for welding may be taken from any direct current system, providing sufficient resistance be used to reduce the voltage to that required at the arc, it is economical to use a specially-designed low voltage generator, independently driven. This is the system employed at the plant described; the compound wound generator has a capacity of 300 amperes at 60 volts, and is wound for constant voltage.

The motor-generator set is mounted in a room separate from the welding station, which latter is shown in Fig. 2. The control equipment consists of a main generator panel, ammeter, volt melter, overload circuit breakers, field control switch, and rheostat, together with the welding circuit control apparatus. This consists of an automatic switch with its relay, and a hand-operated rheostat switch in series with each welding circuit. The small panel nearest the observer in Fig. 2 controls an auxiliary welding circuit, so that two operators can be supplied with current from the one generator at the same time. Once the series resistance is set no further adjustment is needed by the operator, but, should the current become excessive, the series relay permits the magnetic contactor to drop open and break the circuit. When the arc is thus broken the circuit is automatically restored by the relay, so that the arc can be drawn afresh by the operator for a new start.

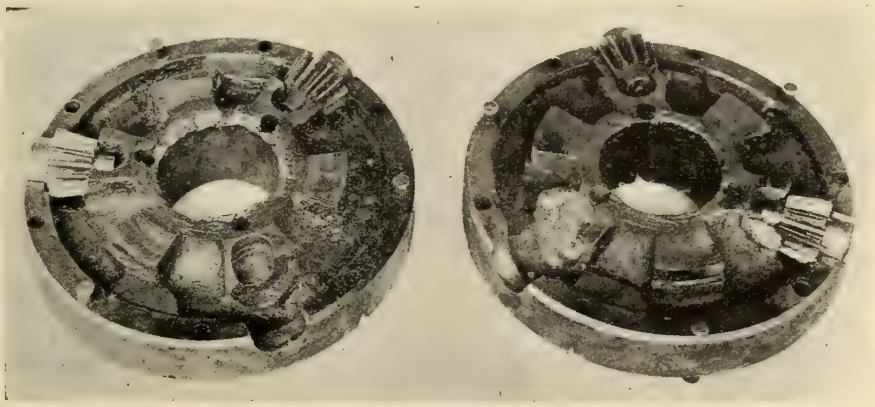


FIG. 4.—CHUCK BODY WITH BROKEN WALLS ON PINION SOCKETS. LEFT, DAMAGED BODY. RIGHT, BUILT UP ELECTRICALLY, SAVING LOSS OF ARTICLE.

Additional Applications

Besides the uses mentioned, there are many other industrial applications where electric welding may be used to advantage. Fig. 4 shows how broken castings may be repaired by welding on new metal. The pieces shown are the backs of scroll chucks put out of commission by the breakage of small lugs which had worn thin. Welding restored these at a cost of a few cents. Often it is possible to reclaim castings, where large blowholes are found in the course of machining, by filling up the hole without removing the casting from the machine.

Another application which has proved satisfactory in foundries and steel works is the opening of tap holes and tuyeres in furnaces. The furnace is made the positive terminal of the circuit, and the negative is a solid carbon rod, 2 inches in diameter and 4 ft. long, fitted into one end of a wrought-iron pipe, which is provided with a wooden handle at the other end. But perhaps its largest field has been in railroad and marine repair work. Repairs on boilers are made quickly and with no tendency to develop strains in cooling, because the heating is almost entirely localized, thus practically avoiding such strains after the weld is completed.

The cost of an electric welding outfit such as described is many times that of an oxy-acetylene or other system; but for such work as it is best adapted to it can be operated at from one-half to one-fifth that of any other known welding method. The plant of the Hamilton Gear & Machine Company is the first of its kind to be installed in Toronto for general commercial work.

◆

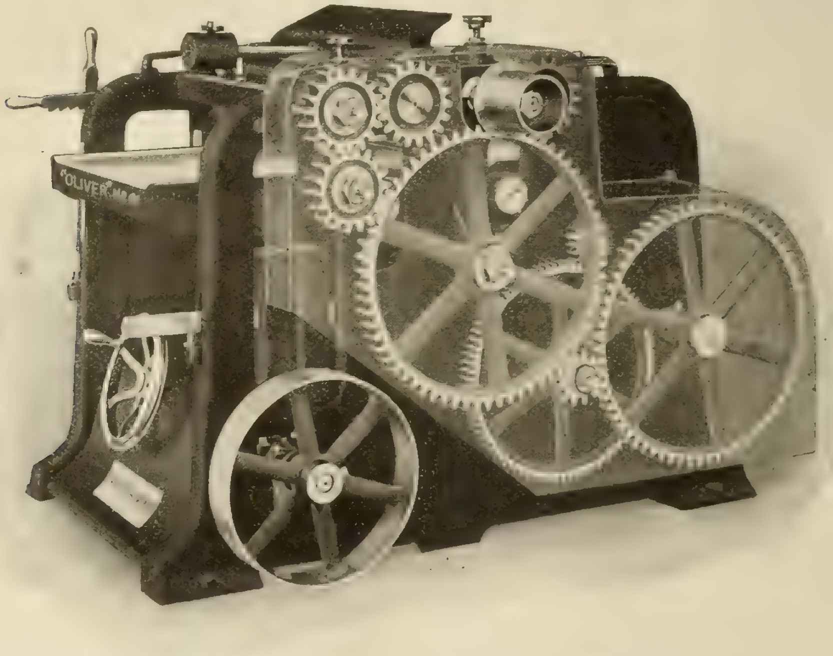
Will Erect Foundry.—Darling Bros., of Montreal, have broken ground for their new foundry, which will be located on the site of their old building on Ottawa Street.

CABINET SURFACER

A cabinet surfacer built by the Oliver Machinery Co. of Grand Rapids, Mich., is illustrated herewith. This machine has a number of improved features.

The demand for an accurate smooth planer capable of a wide range of work both in soft and hard woods is well met in the design of this planer, its correct design, compactness, feeding power and general efficiency making it readily adaptable to the requirements of pattern makers, aeroplane manufacturers, government shops, engineering works, shipbuilders and railroad car shops.

The machine is made in two widths to plane either 24 in. or 30 in. wide and the bed will lower to receive and plane material up to 8 inches thick. The standard feeds furnished are 14, 18, 24 and 31 feet per minute.



SINGLE CYLINDER FOUR ROLL DOUBLE BELTED CABINET SURAFACER.

The sides are of cored form, the girts are heavily ribbed machine jointed and bolted. Ample material, properly distributed, eliminates strains and vibration.

To assure perfect balance, hence smooth planing, the cylinder is of the circular type, made of a crucible steel forging of uniform texture and belted at both ends. It carries two thin high speed air hardening steel knives securely clamped against hard steel chip breakers, whose lips are shaped to repel shavings and chips. The entire cylinder is nicely ground to perfect size. The journals are long, of unusually large diameter and machine ground.

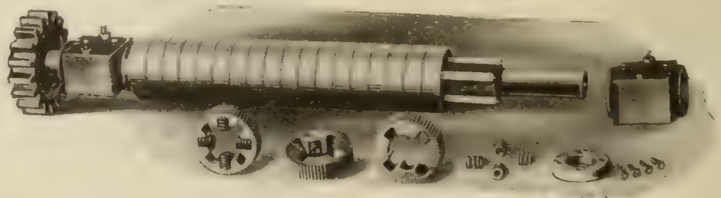
The cylinder pulleys are two in number, and their faces are grooved spirally, preventing air pockets under the belts and augmenting the belt power through its close contact with the pulleys.

The cylinder bearings are of the self-oiling side-clamping type with large oil chambers. They are readily adjusted to hold the cylinder firmly in place for smooth planing. Readjustment of caps can be made instantly.

The back pressure bar follows the cylinder and is held by adjustable screws for regulating the hold-down pressure on the lumber as it leaves the cut. The throat between the front and rear pressure bars is only 2⅛ inches for service in planing smoothly and without end clipping on very short stock.

The chip breaking pressure bar before the cut holds the lumber firmly to the bed as it is planed, and prevents the chips from tearing its surface. It is attached to the main frame in such position that it raises concentrically with the cylinder, thus preventing the bar raising into the knives. A steel spring shoe is secured to the lower part of the bar, which not only holds the stock firmly on the bed but yields to any ordinary inequalities in rough stock. An adjustable weight regulates the pressure.

The bed is of suitable dimensions, gibbed properly, and is raised in a wide central slide that is deep to give the bed the proper rigidity. A guide is located at each side to prevent material from leading away from the bed and striking the frame or gearing. The bed is supported on heavy square thread screws with ball bearings, reducing friction and permitting the raising of the bed without exertion. The bevel gears used in elevating the bed are machine cut and are protected from dirt by a wide shelf that covers the inner space below the table and keeps the shavings within the frame making it very easy to clean around the machine. Directly underneath the cylinder is a centre plate adjustable to wear, removable from the bed when worn. It may be redressed and refitted or discarded for a new one as the occasion demands.



SECTIONAL FEED ROLL SHOWING POSITIVE DRIVE AND STRONG CONSTRUCTION.

There are four feed rolls, one pair back of the cylinder to feed the material free of the knives and assist in carrying it through the machine. They are large in diameter, made of hammered steel and are supported in self-oiling boxes. The upper feed-in roll is corrugated for gripping the stock firmly. All the rolls are driven by a train of heavy gearing, three pitch, the teeth machine cut, insuring a smooth and positive feed. The feed-in rolls are weighted and the delivery rolls have spring tension. The upper delivery roll has a cover over it and is provided with a scraper which keeps the rolls free from shavings.

Sectional feed rolls may be provided when so desired. It consists of sections 1⅛ inches wide and 4 inches diameter. While giving a horizontal drive as positive as a solid roll, they yield vertically independently of each other to the extent of 3/16 inch. Each section is composed of an outer ring enclosing four sections or seats placed radially to the centre of the roll shaft and each carrying a helical spring.

The sectional chip breaker consists of 1⅛ inch sections pivoted in connection with section weights, on two horizontal bars attached to two plates. They yield concentric to the cylinder independently of each other.

The gearing that transmits the power to the rolls is all machine cut and perfectly finished throughout. Such gears as revolve on steel studs are provided with oiling devices that are right. Grease cups mounted on each stud furnish oil through channels in the studs to the inner surface of the hubs, producing effective lubrication. The studs are large and the bearings for shafts that pass through the machine are fitted with dust-proof spring oilers. The master driving pinion is hammered crucible steel and machine cut.

A grinding attachment is provided which will quickly and accurately grind the knives of planers and jointers without the trouble of taking the knives off the machine. The attachment can be quickly mounted on the machine or removed therefrom. The motor is mounted in grinder head; current is taken from an ordinary lamp socket.

AUTOMATIC ELEVATOR FOR SHELLS

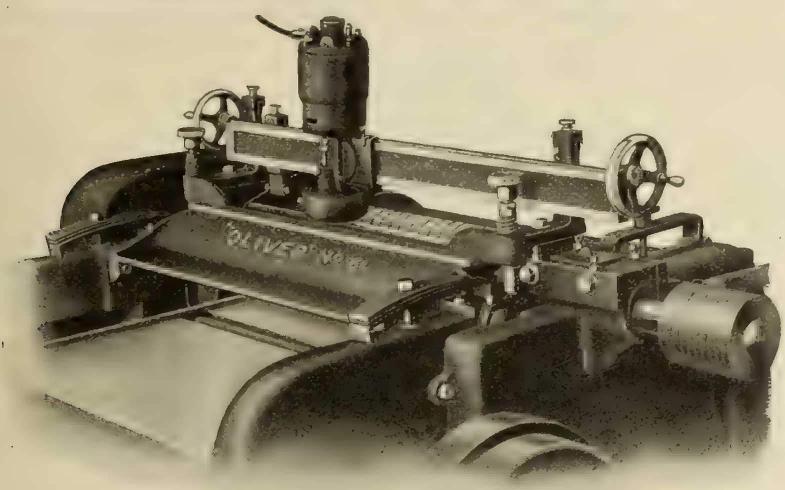
THE AUTOMATIC elevator illustrated in the accompanying engraving has been recently designed and erected by Ed. Bennis & Co., Ltd., of Little Hulton, near Bolton. It is arranged both to elevate shells or similar cylindrical bodies from a lower to a higher level, and to lower them, and can perform these operations simultaneously. A feature of the appliance lies in the fact that the articles do not pass round the top or bottom drums either when being raised or lowered, the feeding and discharging in each case taking place on the same side of the elevator.

The elevator can conveniently be bolted to a wooden framework. This framework is provided with bearings for the shafts of the top and bottom drums shown in the engraving. These drums are of cast iron, and are provided with sprocket teeth to engage the elevator chains. The shaft of the upper drum is extended to carry a driving belt pulley. The endless elevator chains are two in number, and are formed of cast steel links united by mild steel rivets. At intervals the two chains are connected crosswise by a horizontal rod. These rods serve as spindles whereon the shell carriers are pivoted. The carriers are built up of lever-like cast steel bossed plates A, the number of such plates in each carrier varying with the length of the article to be lifted.

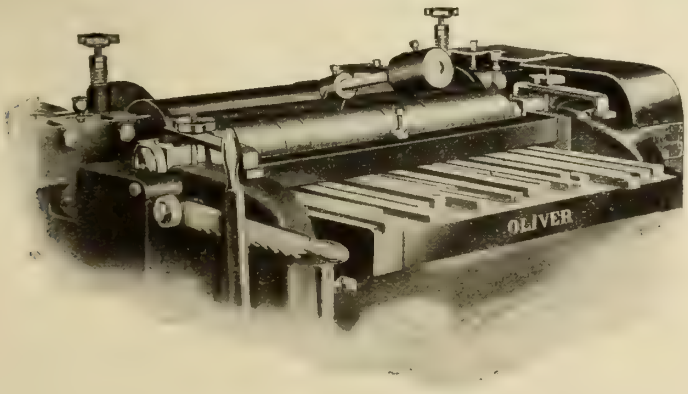
The plates, pivoted on the cross spindle at B, are riveted together at C, and are joined by an axle at D. This axle does not rotate, but carries at each end a roller E, the body of which is hollow and filled with lubricant. The rollers work against two pairs of mild steel angle iron guides, F, G, fixed to the wooden framework.

The shells to be raised approach the elevator by rolling down a gently sloping table H, at the end of which upturned steel prongs J are fixed. The plates of the carrier passing between these prongs lift the lowest shell, which rolls into the position shown at K. On reaching the level at which the shells are to be discharged, the rollers of the carrier pass into a bend L in the guides F. This causes the carrier to tip the shell on to the gently-sloping discharging table M, the end of which is provided with straight prongs.

Passing over the top sprocket drum the carrier, now upside down, is available for lowering shells from the level N to the level P. The table at N slopes gently towards the elevator, and at its end is provided with a group of pivoted and balanced prongs Q. Two of these prongs are formed with projecting lips R against which projections S on two of the plates of the carrier strike during the descent. The shell resting on the prongs Q is thus allowed to fall into the hollow on the back of the carrier, as at T, is lowered thereon until it reaches the fixed straight prongs U on the end of the lower table P.



GRINDING JOINTING AND SETTING ATTACHMENT IN USE.

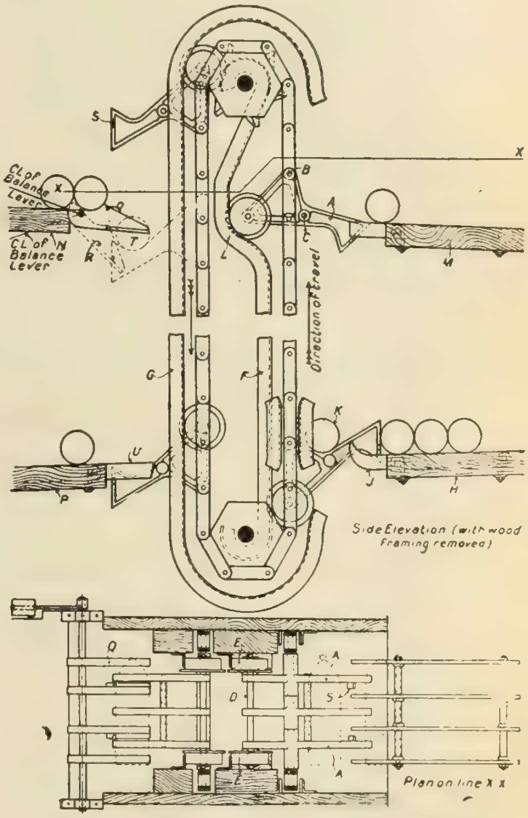


VIEW OF TABLE SHOWING FEED ROLLS.

◆

BUYING ZINC OUTPUT

NEW YORK.—The Board of Trade and the Zinc Producers' Association of Australia have agreed on the purchase by the British Government of stocks of zinc concentrates existing at the end of last year to the maximum extent of 250,000 tons per annum for the period of the war and one year thereafter, and 300,000 tons per annum for the subsequent nine years. Australian zinc is produced as a by-product of lead-silver ores.



PLAN AND ELEVATION OF SHELL ELEVATOR

ONE motor truck every thirty minutes is the war-time record of a Walthamstow, England, factory, which formerly engaged in omnibus construction. The "Commercial Motor" describes part of the plant as a "machine" consisting of a roofed building in the form of a passage, the floor of which is a conveyer, moving at a speed of 1 ft. per minute. The operating levers and cogwheels in the machine" are the deft and busy fingers of twenty-five men and twenty women. And the capacity of this active little band of workers is one 3-ton truck completely erected, painted, filled up and ready for its road test every half hour! In a ten-hour day often nineteen or twenty such vehicles are produced.

CANADIAN FOUNDRYMAN
AND
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NATIONAL CONCENTRATION

ALMOST four years of warfare have removed most of the national hesitation, nervousness, indecision and ignorance which came to light occasionally as the tide of fortune ebbed and flowed in the great struggle. Periods of elation and depression have alternated. When the United States entered the war spirits ran high, to gradually subside awaiting definite accomplishments by our big Ally.

It was presumed by many, that, having the benefit of British and French experience, plus American hustle, things would be doing soon. Despite the disappointment experienced by those expectant enthusiasts, the work of the States during the last year has been on a colossal scale, characterized by a deliberateness of action and actuality of accomplishment which in days to come will be more than ever appreciated. Treachery and treason are best dealt with silently.

The increasing importance of the United States forces, due to the rapid growth of numbers and the development of home sources of war supplies, is of particular interest at this time. Not the least interesting phase is the publicity given to actual accomplishment, and the calculable effects of real facts on the morale of the enemy is probably one reason why such work is given special attention by the authorities at Washington.

An announcement by the Shipping Board shows that one wooden ship per day has been turned out for the past few weeks and steel vessels are being delivered almost as rapidly. In noting this fact it should be observed that one factor has been the overcoming of the lack of transportation. A great speeding up in the delivery of cars for transporting shipbuilding materials is reported by authorities and what has been done in respect of this industry will doubtless be accomplished for the rest of the country's activities in proper rotation.

IS THE STEEL TRADE DUE FOR A REACTION?

ONE of the features of Britain's industrial effort since 1914 has been the expansion of the steel industry. From seven to twelve millions of tons is a large increase at any time, and when the latter was announced last year, reference was made to further increases expected.

That these further increases would be accompanied by an increase in price was hardly to be expected, yet reference is made in recent advices from Britain to an evident agitation for an increase in maximum prices, while at the same time some concern is being displayed regarding the future demand for so much steel and iron. There may be some commercial politics at work behind the two activities, but an interesting feature of the case which is not disputed is the large supply of high speed steel which is now available.

English makers of high-speed steel who have been accustomed to receive orders greatly in excess of their capacity have now caught up with the demand, many of them actually reporting that new orders are not keeping up with production. The London *Ironmonger* states that conditions are intensified by the return to Sheffield from various seaports of large quantities of high-grade steel which had been purchased for shipment to Russia. In addition to the loss of that market it is understood that France and Italy are extending their home manufacture of tool steel and require less from Sheffield; there is also a heavy drop in the consumption of the shell shops and export trade has been reduced to a minimum by Government regulation.

Just how long the latter feature will obtain is at present a matter of conjecture but it is reasonable to expect that Canadian built and owned ships will be allowed to remove some proportion of a surplus essential like high-speed steel and the re-appearance of this material of English manufacture should not be unlikely. Its return is at least desirable to the extent to which it may forestall and prevent the revival of such business with German firms at a later date.

If a firm has accepted a contract, based on certain existing shop conditions, and then through patriotic and other methods induces the help to become more efficient, the help must share accordingly. Perfect frankness must accompany any proposed reduction, and the suggestion has been made that a committee of employees should act on behalf of the shop hands and be informed and consulted where a reduced rate is obviously reasonable where conditions have been brought about by the firm's initiative and at their expense.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

THE CORROSION OF IRON AND STEEL AND ITS PREVENTION

By Abe Winters

Faraday's Law of Corrosion

Faraday's law of the corrosion of metal in weak acidulated solutions and electrical energy applied to the anode is 1.0448 grains of iron per square foot per ampere hour. The film formed over the surface of iron or steel by the process under consideration is an insulating film, the insulating properties of the film render the processed metal impervious to galvanic currents or electrolytic corrosion as long as the film is intact at every joint. Hydrated rust carries over 20 per cent. of moisture, and so long as it can attack a fresh surface of iron and cast off the thin film of oxide as it forms it will release enough oxygen to begin another cycle of action. A pin scratch on a phosphorized steel surface will be sufficient to allow corrosion to begin and eventually destroy the entire article. Tests made under our personal supervision verify this statement.

Rust which forms on iron or steel is hygroscopic and carries 24 per cent. of moisture as it forms. This moisture never dries out under any atmospheric heat conditions, but is ever ready for a chemical decomposition; the hydrated red rust being nearly twice the volume of the iron from which it is formed, adds its efforts to the free hydrogen to push through the phosphate film and eventually create havoc over the entire surface. This mechanical action is far more energetic than mere casual observation would lead one to imagine. A very important requisite of rust-proofing coatings is a galvanic property to protect the underlying iron which may become exposed by scratches or pinholes. This property is totally absent in coatings produced in phosphorous-manganese solutions by simple immersion. The coating is non-metallic and the temperature at which the solution (212° Fahr) does not influence the structure of the metal surface or expand the pores of steel sufficiently to permit a penetration exceeding .001 inch.

Properties of an Ideal Rust Preventative

An ideal protective coating should be completely resistant, not only to chemical corrosive agencies but should be hard and tough to resist mechanical wear or abrasion. It should be capable of protecting the underlying metal by galvanic action. All rust-proofing films formed in acidulated solutions containing manganese dioxide, calcium or ferric oxides, do not possess properties conducive to automatic galvanic protection, furthermore these solutions are more expensive to operate commercially than the average manufacturer would expect after only a partial investigation of the process. It is not the intention of the writer to absolutely condemn phosphorous-manganese rust-proofing for iron and steel, the process has many very excellent features and is by no means totally ineffective or unscientific. The phosphate coating is more resistive to atmospheric influences than is generally admitted. If the coating is further protected by oil, wax or paint the results are often very satisfactory. Responsible authorities agree that for many purposes, particularly on small wares, the phosphate process is efficient and may be used commercially at reasonable cost.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

The excessive costs are usually the result of high chemical expense and unnecessary waste.

Group No. 4

In this group we have several metals which are electro-positive to iron, which would give us the desired result; some of these are antimony, arsenic, potassium, sodium or zinc, but about the only practical or commercial metal in the class is zinc. Zinc is a peculiar metal of pronounced characteristics. It is relatively low in malleability, ductility, tenacity and infusibility when compared with other metals. Zinc has a melting point of 419 degrees C., and under atmospheric pressure a boiling point of 918 degrees C. On this basis of silver at 100, zinc has an electrical conductivity of 29 and a heat conductivity of 36. It is practically non-corrosive in the atmosphere, a thin protective coating of carbonate of zinc forming upon it. Zinc is one of the highest electro positive metals, it having a potential of 0.493 volts.

Hot galvanizing, or the application of molten zinc to a metal is a commonly known process. The quality of the coating depends not only upon the size and nature of the article but also to a large extent upon the skill of the operator, who must use care and give constant attention to the work.

Cold galvanizing or electro-plating is the process of depositing a coating of zinc upon the metal to be protected by means of an electric current and an electrolyte. For many purposes cold galvanizing has proven particularly efficient, but, has never been regarded as a practical rust-proofing process for use on wares which are subjected to unusual corrosive influences or ordinary abrasive action resulting from natural causes. There are several very simple formulas for acid zinc plating solutions, these being more generally employed. Cyanide zinc plating solutions are to be preferred for some purposes, but the maintenance cost of cyanide solutions is an important consideration in commercial practice.

Sherardizing

The Sherardizing process of coating iron and steel with a rust-proof film of zinc was discovered in an accidental manner by Mr. Cowper Cowles of London, England, but is not essentially a modern idea as a process practically the same was known in prehistoric times; it, however, was used for a different purpose. Copper tools, vessels, etc., were placed in the ground in certain localities and kept hot by fires built over the spot, on removal the copper was found to have acquired a light yellow color and become harder. This was really dry galvanizing although an alloying of the two metals was not recognized. In Greek history Aristotle records the "bleaching of copper" by the same method.

Sherardizing is to-day a patented process but is without doubt the most effective rust-proofing process known for general purposes. Naturally there are many cases where the requirements favor such processes as the application of vitrified enamel, phosphate films or hot galvanizing, but for the majority of modern commercial needs the treatment of iron and steel by the electro-Sherardizing process is the acme of perfection for the production of protective coatings. Samuel Trood has refined the process of Sherardizing as follows: A process of sublimation, occlusion and adhesion, when considered in connection with the theory of ions. The process of passing directly from the solid state to the gaseous state and from the gaseous state direct to the solid state, in both cases stepping over the liquid state, is called sublimation.

Zinc as a solid may change into vapor without passing into the liquid state. For an exact definition of the physical condition of a body a knowledge of the values of all its variable properties is required. The three most important of these are temperature, pressure and volume occupied by unit mass of the substonce. It is a well known fact that the common metals are extremely porous. This is visible under a high power magnifying glass, as well as readily demonstrated by certain physical experiments. The condition of the metal may be graphically described as resembling a sponge soaked with water.

Occlusion

When a porous solid is easily permeated by a gas and condensation on the surface of the pores of the solid takes place it is called occlusion. An example of this may be seen in the absorption of 90 volumes of ammonia in one volume of charcoal. Nearly all metals absorb gases and, being heated, will allow them to pass through readily. An example of this is the fact that hydrogen will pass through heated iron. When a gas is in contact with a solid there are molecular forces drawing the particles together and this produces a surface condensation of gas on the solid. An example of this is the frosting of window panes in irregular figures. There also appears to be an electrical condition accompanying the evolution of gases from a metal inasmuch as the evolved gases usually contain a number of free ions. Naturally the exposed surface of the metal is the only portion which actively takes part in evolving gases so that the larger the area of surface exposed the greater the evolution of gas, other conditions being equal.

To be continued

Questions and Answers

Question—During the process of cleaning petroleum oils from imported steel sheets and tubing we sometimes find it necessary to allow the steel to remain in the cleaning solution for several hours. The solution used is a mild alkali and is employed as a simple immersion cleaning bath, no electric current is connected to the bath. The solution is heated by means of steam coils and the tanks are of sheet steel resting on wooden blocks. Tubes remaining in the solution more than one or two hours become seriously corroded in spots where two tubes are in contact; the corrosion is equally as destructive to one tube or sheet as to the other in contact. Red oxide of iron forms in considerable quantities and the surface of the steel is so deeply attacked that a special operation upon a polishing wheel is necessary to remove the defect. Will you please explain the cause of the trouble and inform us of some means of preventing the corrosion as it has proven an expensive handicap in maintaining our output of finished wares. The cleaning operation is performed in our plating department prior to plating and japaning?

Answer—The corrosion which you describe is what is termed electrolytic corrosion and is defined as chemical decomposition effected by means of an electric current. In the case you mention the tubes or sheets are the iron electrodes and being suspended in a solution of alkaline metals or earths, the salts of these alkaline metals or earths are decomposed, their acid radicals attack the anode (tube or sheet with positive charge) forming an iron salt. The action is very similiar to the action of an electro-plating bath, a current of electrical energy is instituted from one piece to another and the object from which the current flows will be corroded.. Induced currents are often strong enough to corrode metal, even when the conductors are of adequate size. Less than .005 volt establishes electrolysis, the amount of which is in proportion to the amperes present and not to the voltage. To prevent the electrolytic action in the cleaning bath, insulate the steam pipes entering and leaving all steel tanks where electric current is used, replace the wooden blocks with new dry blocks and as a further precautionary measure place ½ in. plate glass between bottom of tank and wooden block. If you are using one of the many cleaning compounds now commonly used, which contain certain percentages of aluminum oxides, use 4 oz. of soda ash per gallon of solution. Rods across top of tank should not rest directly upon the edge of the iron ends but upon wooden strips or a wooden frame may be made to fit the rim.

* * *

Question.—What Beaume density do you advise for a cyanide copper solution which is used continuously for coppering steel stampings?

Answer.—A cyanide copper solution registering from 5 to 8 degrees Beaume and with sufficient free cyanide to maintain free working anodes will produce more perfect deposits at lower maintainance cost than a solution of greater density. Use the solution at about 120 degrees.

* * *

Question.—I have recently received letters of complaint regarding nickel plated brass compass boxes which our firm manufacture. The boxes are magnetized, some very little, some very seriously. Upon investigation I have traced the difficulty to the plating treatment. The effect is more pronounced during some days than during others. I have tested several boxes which were nickel plated about five years ago, in the same manner as at present, in the same solution and by the same operator, and find them absolutely free from any defects such as are produced at present time. I have exhausted my patience over the problem and shall greatly appreciate even a kindly interest in the matter on the part of your staff?

Answer.—The magnetized condition of the compass cases may be due to one of the possible causes, iron objects lying at the bottom of the bath and being acted upon by the solution, or by the current and solution if causing a slight short circuit at intervals, which would possibly account for results being better on one day than other days. Iron from the nickel anodes or nickel salts will contaminate the nickel solution in a similar manner and affect the deposit. Iron hooks dipping in the solution are also liable to corrode sufficiently to cause annoyance. We suggest thorough cleaning of the tank and the use of high grade single salt solution and purest nickel anodes obtainable. Exercise care at all times in order to prevent iron or steel objects remaining at bottom of bath if dropped. The condition of the finished cases is not caused by the quality of brass being used, neither will the thickness of the electro-plate affect the magnetized condition, a thin plate being practically as conducive of the trouble as a thick plate.

* * *

Question.—We have several gallons of nickel solution which was freshly made about one year ago, the solution has been filtered once since making and has been used constantly every day. The solutions contain both single and double nickel salts, magnesium sulphate and boracic acid; sulphuric acid has been added occasionally to maintain working condition. During the past few months a shiny flocculent brown substance has gradually accumulated in the solutions and has now become very troublesome because of its adherence to the parts in process and the production of a mottled uneven surface to the finished piece which is often extremely difficult to color or remove without an extra operation such as oiling off with flour emery or tripoli. Will you kindly inform us of the nature of this brown mass and suggest a method for its elimination or a prevention of the condition as described heretofore?

Answer.—The bulky brown floating particles which are present in your nickel solution and settle upon the parts in process of nickeling are merely particles of iron hydroxide and may have originated in the anode or been introduced with the nickel salts, probably the latter, as iron is present in nearly all commercial nickel salts. There are two methods which are practicable for avoiding the difficulty occasioned by the presence of the iron in the solution,—increase the metallic content of the bath to a point where the concentration of the solution will prevent free circulation of the bulky iron particles, and cause the mass to accumulate as slime at the bottom of the tank, extreme acidity assists in this method: or,—the iron hydroxide may be entirely avoided by the judicious use of either citric acid or ammonium citrate. We prefer the acid and suggest that you dissolve ¼ lb. of the citric acid crystals in one quart of cold water; of the resulting solution add four or five fluid ounces to each 200 gallon bath and stir the solution well. Allow to settle overnight and operate as usual. The solution should be rendered beautifully clear and free from turbidity by this treatment. Care should be taken not to add too large quantities of the citric acid solution at one time. While it is not absolutely essential that the slime be removed from the anodes before the addition of the citric acid, it is good practice to free the bath of as much of the slime as possible by siphoning and filtering the solution before disturbing the anodes, then brush the slime off carefully and with proper management of the solution you should escape further difficulty from imperfect deposits resulting from the iron hydroxide.

* * *

Question.—Will you kindly publish a reliable formula for a brass solution, using the cyanides of copper and zinc in place of carbonates of the same metalts.

Answer.—Dissolve 5 lbs. of 98-99 per cent. sodium cyanide in 5 gals. of luke warm water . In a separate vessel dissolve 1 lb. sodium carbonate in 5 gals. water, also 1½ lbs. sodium bisulphite added slowly; then add 2 1-3 lbs. copper cyanide and 1 3-8 lbs. zinc cyanide. Stir well until a complete solution of the salts is effected, then add the sodium cyanide solution to the metal cyanide solution and stir vigorously while making the addition. Electrolize with strong current for at least one hour, then add 1 oz. of liquid ammonia and enough free sodium cyanide to produce satisfactory deposit. The quantities here given are for 10 gallons of solution. Use the bath at from 80 degrees to 120 degrees F. with moderate current density and a tension of 4 or 5 volts.

* * *

Question.—I have recently received a formula from France for a plating solution; the quantities being all given in grams and litres. Will you advise me how to figure the requirements in ounces and gallons?

Answer.—Measure the tank you intend using, in the same manner as is customary in this country, but, instead of calculating to gallons from cubic feet, multiply the cubic feet by 28.3137. This gives the number of litres in the tank. To convert grams per c.c. to ounces per gal., multiply the number of grams by 138.98. To convert grams into ounces (avoirdupois) multiply the grams by 0.43527.

* * *

Question.—I wish to enquire how I may produce the hardware green finish on cast or sheet brass?

Answer.—Disolve two ounces of iron nitrate in 2 gals. of water in which 8 to 16 ozs. of hyposulphite of soda has been dissolved. The results are best when solution is used quite hot.

* * *

Question.—I wish some information regarding the effect of solution conditions upon the tensile properties of elctro-deposited copper, with specific reference to acid copper solutions. Please advise me of the nature of these conditions?

Answer.—The U.S. Government have given this particular point considerable attention and the investigators acertained the conditions affecting the tensile properties of copper deposits from acid solutions to be approximately as follows:

Agitator.—With low current densities the degree of agitation does not have a marked effect upon the properties of the copper, while with higher current densities very effcient agitation is required to produce even coherent deposits. In general, the finer the crystals the higher is the tensile strength. Under otherwise uniform conditions an increase in the content of copper sulphate usually causes a slight increase in the tensile strength. Under otherwise uniform conditions an increase in the content of sulphuric acid at low temperature (25 deg. C. or 77 deg. F.) usually causes an increase in tensile strength, and at high temperature (40 deg. C. or 104 deg. F.) usually causes a decrease in tensile strength. These effects are most marked at intermediate current densities. No explanation of this anomaly is suggested . Further experiments at other temperatures are desirable to throw light upon this behavior. A rise in temperature generally decreases the tensile strength. This effect is most marked with high acid content and with medium current density, in which case the decrease in tensile strength may amount to 50 per cent. At low temperature, the tensile strength increases with increased current density, up to about 56 or 65 amperes per square foot and then remains nearly constant, or in some cases decreases slightly.

A few experiments conducted upon the effects of annealing the copper show that a decided decrease in tensile strengt is produced by heating these thin specimens to temperatures of from 340 deg. F. to 720 deg. F., and that the greater part of this change ocurs in the first 30 minutes. Annealing at the lowest temperature appears to cause a reduction in ductity, while at the highest temperature the ductitity was silghtly increased. No corresponding change in structure in the annealed specimens could be detected (miscroscopically), indicating that the change in tensile properties was caused by the relieving of internal stresses. Annealing at higher temperatures is required to produce visible structural changes.

THE PREVENTION OF BRITTLENESS IN ELECTROPLATED STEEL SPRINGS

According to the Journal of the Franklin Institute one of the serious problems which confronts the makers and users of non-corroding steel springs is the brittleness produced therein during electroplating. The embrittlement is generally conceded to be caused by by the nascent or atomic hydrogen which is liberated at the cathode. The fact that iron takes up nascent hydrogen at low temperatures and is made very brittle thereby was developed by a number of investigators about 1870 to 1880. Numerous researches showed that the flexibility and elacticity of iron wire and steel springs are greatly decreased by pickling, and that the effect is the more marked the thinner the material. Electrolytic iron may contain nearly 250 times its volume of hydrogen, while the commercial iron averages only one-half of its volume. Tects were made of the breaking strength of seven untreated springs; then tests were made of similar springs electrically copper plated, pickled in sulphuric acid, and tinned by dipping in molten tin and then copper plated. The pickling and the copper plating both cause brittleness, but tin dipping before copper plating is found to prevent embrittlement entirely. Steel springs may be dipped in molten tin at a temperature of 260 deg, to 300 deg. C. without appreciably changing their mechanical properties.

MOLDER'S EXCUSE FOR BAD CASTING

1. Rotten sand.
2. Bum facing.
3. Dull iron.
4. Dirty iron.
5. Flask burned out.
6. Dog walked across mold.
7. Plumbago no good.
8. Rat went down riser.
9. Iron ran down rat hole.
10. Laborer knocked off clamp.
11. Bars in cope loose.
12. Hard iron.
13. Too much "kish" in iron.
14. Cores too hard.
15. No vent in cores.
16. Too much flour in cores.
17. Boy didn't skim iron.
18. Boss didn't give me enough iron.
19. Boss didn't tell me.
20. Iron came too late.
21. Iron came too soon.
22. Chaplet blew.
23. Couldn't get holdup.
24. Partner wouldn't look under.
25. Wind blew dirt down riser.
26. Shop too dark.
27. Shop too light.
28. Laborer fell over mold.
29. Core blew up.
30. Laborer couldn't talk English.
31. Cross-eyed cat ran over mold.
32. Blue Monday, Jinks.
33. Hole in bottom board.
34. Apprentice stepped on soldier.
35. No gaggers in shop.
36. Swab pot fell over on mold.
37. Pattern was warped.
38. Pattern was made wrong.
39. Boss didn't tell me to cut gate.
40. Iron too kickey.—From Chippings.

To Make Pumps.—Peacock Bros., of Montreal, have acquired a two-storey brick building on Delorimer Avenue, and are installing equipment for the manufacture of various types of Weir pumps.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	28 00
Copper, electrolytic	28 50
Copper, casting	28 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	22 50
Copper, heavy	22 50	22 50
Copper wire	22 50	22 50
No. 1 machine composition	22 00	21 50
New brass cuttings	16 00	14 00
No. 1 brass turnings	15 00	15 75
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	20 50
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	31 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	20 00	13 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	7 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.o.b. Pittsburgh.

PROOF COIL CHAIN.
B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 47
Solder, guaranteed	0 50
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	8 95
Premier, 10¾ oz.	13 85	9 25
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%: headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to $0.54
Copper	.44 to .46
Tin	.49 to .56
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Arsenic, white	.12
Caustic soda	.07
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate ......(per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.41
Sodium cyanide, 98-100%	.38
Sodium hydrate	.04
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 6- 9
Tripoli composition	06 to 9-10
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55
Crocus composition	08 to 8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 38
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

TORONTO.—Although commercial orders are being discouraged by the War Board, by the dealers themselves, and practically by every person who is trying to give priority to war orders, indications are not wanting that there is a good amount of this business piling up against the day when the barriers against it shall be let down. As a matter of fact there are commercial lines that are very closely allied to the war, and to the safety of the individual in the meantime. One Toronto concern is in the market this week with an order for well on to a thousand 3½-inch boiler tubes of the eighteen-foot length. There is a good chance of this order being passed by the War Board, as it is for the repairing and upkeep of power and heating systems. But the boiler tube situation is now at the state where it can be correctly described as acute. The warehouses are practically bare of the two-inch size, and this is the type used very largely in the average boiler, the locomotive, threshing boiler, etc. There are many cases, so we are informed, where tubes are needed to make necessary repairs, but those wanting them are meeting with no success at all in having their needs attended to.

A man with pig iron to sell in Canada at the present moment would hardly need a selling organization or an advertising campaign to help him out, for a needy industrial world would beat a path to his door. The call incessantly is for pig iron and more pig iron. The Munitions Board is having a problem in keeping the shops supplied that are working on war orders. Substitutes that are usually used to "go easy" on the pig iron pile are not to be had in appreciable quantities, the yards being quickly stripped of any offerings that come their way.

There is some speculation regarding the effect that the new freight rates will have on the price of pig and steel coming to Canada from U. S. points. Of course it will be reflected in the price of steel more heavily than in the case of iron. In a ton of finished steel it is required to move almost five tons of raw material to the furnaces, while in the case of pig the amount of basic ingredient is not nearly so great.

The tin market is gradually working into a smaller groove, and trading in it still continues to be a case of making the best possible bargain with the man who has some to sell. One dealer, who is in a position to speak on the matter, stated to CANADIAN FOUNDRYMAN to-day that he did not believe that there could be much over 25 tons of tin in the country at the present time.

The Steel Situation

Some idea of the congestion that took place last winter in the transportation and delivery from the mills can be found in shipments that are coming forward this week. One warehouse in Toronto took in plate to-day, orders for which were placed in the last months of 1916. Orders that are being placed now are making fairly good time. The prices that went to a higher level last week remain at the new figure, and are likely to do so for some time. Staybolt iron advanced ten dollars per ton to-day. The price for this has been firm at \$8.50 per hundred for some months, there being always a good demand for it, its high-grade being relied upon for use in heavy chain work, etc. The boiler tube situation is not improving. "We are not getting any twos at all," stated one dealer to-day, "and there are many cases where it is highly desirable that this size should be supplied. Threshing outfits and a great many locomotives and stationary engines use that size. The larger ones can be had." One Toronto house ordered 700 18-foot 3½-inch tubes for repair work to-day, and the expectation is that the order will be passed by the authorities at Ottawa.

There is a keen demand for plates, the shipbuilders using a large tonnage at present. There is always a fairly brisk demand from the yards for plates to take the place of "rejects" that are found in the shipments, and it is necessary that they should always be able to get these on the shortest possible notice. Apart from the staybolt iron price, no other fluctuations are recorded this week locally.

Second-Hand Metals

There is hardly an interesting feature in the used metal market this week. Prices have not changed since the last letter a week ago, and in many ways there is a feeling of dullness and near-stagnation over the entire business. Just now there are movements under way by which large amounts of non-ferrous holdings may be released for domestic orders. If these go through, the yards here will be in a position to restock, and may be keener to take on business. At present they will buy what is offered at strictly current quotations, this being necessary to protect their credit, but they are not anxious to take on any more material that cannot be turned over to the war appetite establishments.

Tools and Supplies

There is still good business being done by men who have lathes of the heavy type for sale. Other machine tools are in demand, and a large amount of business is turning in both new and second-hand machines. There is a tendency in some parts to take it that the new munitions contracts that have been handed out will create an immense amount of new business. This is not altogether true. It means that many plants are "turning over" rather than starting at the beginning. They will be simply making another size shell and dropping orders that are now nearing completion. In this process there are cases where new equipment is needed, but there are others where only a tooling up is needed to make them ready for business, so it is hardly fair to imagine that every mention of new orders for shells means a new plant and new business for the machine tool men. There is a brisk demand for carbon and high speed goods. Prices keep firm. As a general thing carbon goods are 60 on the list now, while the high speed is two and a half times the list. An order was sent out, becoming effective on the first of June, by which prevailing lists on valves are cancelled, pending the issuing of a new list. Prices generally are ten on the list now, but the withdrawal of the old lists is taken to forecast an increase which dealers anticipate will run the new price well on to 35 on the list. Chucks are scarce in some places, particularly the 9 to 12 size, and there is always more or less delay in getting permits to bring them across the border.

Firms operating on lines that depend on the non-ferrous metals for raw material are not yet feeling the war pinch to the same extent as those using iron and steel, which come more directly under the notice and control of the War Board. As long as the supply lasts there seems to be no disposition to hold it up. Tin is scarce. There's nothing new in that statement, but it is becoming increasingly scarce. There are not over 25 tons in the country just now, according to one dealer who is in a good position to judge the situation correctly. About the time the war broke out tin used to trade around the 25 to 30 cent. mark, but now a person who has tin to sell can start the bids at \$1.25, and work from there up. Lead is slightly firmer in tone and a slight price advance was recorded this week.

Plating Chemicals Have Gone Sharply Up In Recent Weeks

Foundrymen who are replenishing their stock of plating chemicals and supplies are finding that they are buying from a much higher market. This is especially true of ammonia products.

Ammonium sulphate was quoted a few months ago at seven cents per pound, while to-day the price is placed at 30 cents, an increase of over four times the former value.

Ammonium chloride is quoted now at 40 cents, while not long ago the selling figure was given at 11 cents.

White arsenic, another ingredient used in plating, now sells for 25 cents, being double the price at the first of the year.

Price increases in plating supplies that run only thirty to sixty per cent. are hardly worth making special mention about. So when the man who does plating begins to talk of high prices, don't talk back to him, or he'll floor you.

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CARBORUNDUM

The discovery of carborundum is due to Dr. Acheson, of the United States, who, following up some early work of Moissan, discovered that hard crystals were deposited after passing a current through a mixture of salt and coke. The first sale of this material, which was to a jeweler, was made at the price of £175,000 per ton, the output being at first four ounces a day. As the use of the material for grinding became known its output increased, and the price dropped to £2 per pound, then to one guinea, and later to 2c. per pound. Carborundum will not always successfully deal with steel, with the result that a harder material, alundum, or aloxite, had been introduced for this purpose. It is produced by fusing bauxite, the most important deposits of which are in the South of France, although there are some in County Antrim which are of uncertain composition. The material is produced at the mines and sent to the works of the Carborundum Co. at Manchester, where it is made into various grinding stones. The Norton Company, of Canada, also owns some American deposits of bauxite. Alundum has also been found to act as a good refractory, having a melting point of 2.050 deg. An interesting feature of its use in the electric furnace is that if a silica muffle is wound with platinum wire the wire will not stand the high temperature, whereas when wound round an alundum muffle it will. Alundum is porous and is used as a filtering medium.

TRADE GOSSIP

Chas. Watt, formerly superintendent of the shell department of the Canada Stove and Foundry Company, has accepted a position as salesman with the Foss Machinery and Supply Co. of Montreal.

Endorce the By-law.—At the last meeting of the Welland Board of Trade the action of the city council in bringing in a bylaw in regard to voting on the proposition to secure the Dillon Crucible Alloys Ltd., was endorsed.

Going to Windsor.—The Driver-Harris Co., of Harrison, N.J., are going to establish a Canadian business, and Windsor has been selected for the purpose. The company are manufacturers of and dealers in alloys of all sorts. They looked over several Canadian centres before deciding to locate in Windsor.

J. A. St. Germain, for the past twelve years secretary-treasurer of the Canada Stove and Foundry Company, of St. Laurent, P.Q., has severed his connection with that firm, and has taken over the business of the Imperial Supply Co., 104 Delorimier Avenue, Montreal, as wholesale jobbers and general manufacturers' agent.

Halifax.—At a special meeting of the City Council, it was decided to purchase from Watson, Jack and Company, Ltd., of Montreal, a 900-gallon combined flusher and sprinkler, to be used on the streets of the city, in an endeavor to overcome the dust nuisance.

Chatham, Ont.—W. H. Westman, chairman of the Industrial Committee of the Board of Trade, reports that there are one or two buildings available in this city, at low prices, suitable for manufacturing purposes. Mr. Westman says that there is a good opening here for a foundry.

Increase Capacity.—The St. Lawrence Welding Co. of Montreal have taken over the adjoining property on Inspector Street, which will treble the capacity of their previous plant. In addition to their regular activities in oxy-acetylene and electric welding, they have recently installed a thermit welding plant.

Dunnville.—A vote is being taken of the ratepayers on the question of fixing the assessment of the Monarch Knitting Co., Ltd., at $100,000 for a period of ten years. Ground has been broken by this company for a new smoke stack, 150 feet high and 20 feet across the base. The Foundation Co. will do the work.

Brantford.—A variety of matters occupied the attention of the Brantford City Council. The monarch Tractor Co., Ltd., received a ten year's fixed assessment of $18,000, exclusive of business assessment, and the Waddell Preserving Co. one of $10,425, subject to their completing improvements now under way.

Charles A. McCune has resigned as chief engineer of the Commercial Acetylene Co., to become sales engineer with the Page Steel and Wire Co., 30 Church St., New York, where his efforts will be devoted to sales and service in connection with Armco Welding Rods.

Building Addition.—An addition is being erected to the plant of the Gray Mfg. & Machine Co., at 686 St. Clarens Avenue, Toronto, of two-storey steel and brick construction, 37 ft. x 72 ft., at a cost of $15,000. A travelling crane is being installed and the firm will be better equipped to manufacture their lines of lathes, thread millers, shell blasts, etc. The building is to be finished in five weeks' time.

S. E. Chadsey, assistant to the general superintendent of the Massey-Harris Co.'s plant at Toronto, has been made general manager of the agricultural implement plant at Brantford, Ont., to succeed Franklin Grobb, who has retired because of ill-health. The latter continues his connection with the company in an advisory capacity only. R. D. Johnson has retired as superintendent of the Brantford factory, and is succeeded by John W. Dunn.

Big Shell Orders.—Announcement was made by the Motor Trucks Company, of Brantford, of the acceptance of an order for the manufacture of 9.5 and 4.7 high-explosive shells. The contract approximates an outlay of $7,000,000, and necessitates new buildings and equipment at a cost of $1,000,000. The buildings have to be completed in 45 days. The firm will employ 800 men and women on the completion of the contract, the time limit for which has been set for January, 1920. The company is just finishing up a big contract for the manufacture of 4.5 shells.

Big Nickel Plant.—The contract for the construction of a nickel and copper refining plant at Deschenes, Que., for the British-American Nickel Corporation calls for completion of the job before the snow falls. The plant will be constructed entirely of concrete. The buildings and machinery will cost over a million dollars. It is understood that both British and Norwegian interests are back of the scheme. The production of refined metal from the completed plant will be very large and on a scale hitherto unknown in Canada. The company operating the plant has mines in the Sudbury district, where the smelters are located, so that the business between there and Deschenes will mean considerable of a melon to the railroads in freight charges on the ore.

Held a Conference—Refiners of non-ferrous metals were in conference at the King Edward Hotel, Toronto, with the Dominion Council of Research, of which Dr. Macallum, of Toronto, is the chairman, with the object of arriving at improved methods through which the maximum amount of metal may be reclaimed. Refineries are operated chiefly in connection with Toronto, Montreal and Hamilton industries. The conference was called by Harry Bayne, Supervisor of Metals and Fibre for the Dominion. Prior to refineries being established in Canada, manufacturers sent their foundry refuse to the United States, where the metals were reclaimed. It was suggested some time ago that a Dominion refinery be established in Canada, but such a step was opposed by Mr. Bayne, who favors the development of the industry among the manufacturers.

Knotty Point Settled.—A very important judgment and order has been issued by the Dominion Railway Commission, whereby the inter-switching order has been extended to cover team track deliveries on the various railways. The order, which covers the entire Dominion, becomes effective July 1 next. Heretofore deliveries under the order have been confined to industrial and private sidings. The additional charge for the inter-switching service remains, as at present, in so far as the industrial and private sidings are concerned, but an additional charge will be made for service for team track deliveries. The matter has been hanging fire for several years. There has been more or less trouble with respect to the interpretation of the "inter-switching order," but there is no doubt as to the interpretation of the new order, every clause of which is laid out in detail. Provision is also made for the future at all points where inter-switching tracks may be installed.

Ottawa.—The "Journal Press says: "A serious situation has arisen in connection with the city's effort to obtain a supply of slab or mill-wood. Practically all the available mill-wood in the Ottawa district has been bought up by private wood dealers, the majority of whom, it is reported, will not sell to the citizens now, but are holding it until it is dry, when it will command a higher price.

As a result of this state of affairs the city is taking upon itself the responsibility of asking the government to institute an order whereby the control of the supply and price of mill-wood will be placed in the hands of the Dominion Fuel Controller.

◆

INTENSIVE FUEL CONSERVATION CAMPAIGN IN IOWA

ANNOUNCEMENT was made recently by Royal H. Holbrook, state deputy of National Association of Stationary Engineers of Iowa, that a movement to effect fuel conservation throughout the state had been commenced by the association.

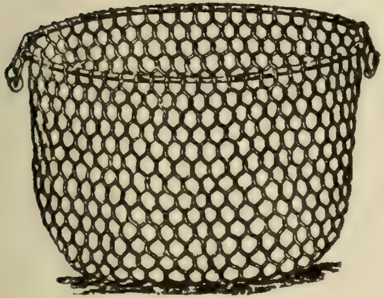
Practical methods are being followed and qualified advisers will be sent to any commmunity, large or small, which makes a request. A few of the most important test instruments will be taken along, such as a Bacharach pocket CO_2 machine, a draft gauge, a thermometer for about 800 deg., some charts for firing illustrations, and lantern slides, so that the engineers and firemen may have one meeting and the general public another. An intensive press campaign will be put on in all state papers, and a still more intensive plan in the city or community visited. The intention is to visit every plant, be it boiler or furnace that sends in a call. The list is usually made in advance by the secretary of the commercial club, which is in most cases responsible for the local expenses. In

MADE
IN
CANADA

Headquarters for

Foundry Facings and Supplies

Highly Serviceable Foundry Ladles



Charcoal or Coke Basket

A Favorite Brush

Bench Rammer

By buying from the manufacturer you get better service than by buying through most agencies, because the manufacturer is invariably keener to serve you—and serve you right.

A few of our lines:

CEYLON PLUMBAGO No. 101

There's no better Facing used anywhere than this high-grade "Hamilton" product. If you are not using it, give it a trial.

CEYLON PLUMBAGO No. 206

is without equal for general machinery castings.

BLACK CORE COMPOUND

is guaranteed 100% pure. Users highly recommend it.

PARTING

bring customers back for more and more. Always equal to the severest test. Ask for sample.

SPECIAL STOVE PLATE FACINGS

is backed by our experience of a quarter century. It is perfect facing. You should use it.

Always well stocked for quick deliveries.

The Hamilton Facing Mill Co., Ltd.

Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

every city where there is an N. A. S. E., they will arrange for a campaign meeting in case it is not on the regular meeting-night programme.

◆

DEPRECIATION AND MACHINERY ACCOUNTS

By E. P. L.

WHEN a new machine is installed the purchaser usually has a pretty clear idea of the period for which it will last—the "life" of the machine. Obviously if its value will be reduced to zero in ten years it will be necessary to write off the book value during that period. But writing off a fixed percentage from the machinery account every year will by no means meet the case. Suppose for the sake of illustration that all the machines in use have an estimated life of ten years. To write off 10 per cent. from diminishing balances would not extinguish the book value in that period, as the following figures clearly show:

	$1,000	
Less 10 per cent.	100	First year
	900	
Less 10 per cent.	90	Second year
	810	
Less 10 per cent.	81	Third year
	729	
Less 10 per cent.	72.9	Fourth year
	656.1	
Less 10 per cent.	65.61	Fifth year
	590.49	
Less 10 per cent.	59.05	Sixth year
	531.44	
Less 10 per cent.	53.14	Seventh year
	478.30	
Less 10 per cent.	47.83	Eighth year
	430.47	
Less 10 per cent.	34.05	Ninth year
	387.42	
Less 10 per cent.	38.74	Tenth year
	$348.68	

Instead of extinguishing the original $1,000, only about two-thirds has been written off, leaving $348.68 still standing as an asset.

The satisfactory handling of depreciation off plant and machinery demands the use of a special inventory. This may be ruled to provide for insertion of the following particulars:

Date acquired.
Description of machine.
New or second-hand.
Purchase price.
Estimated life.
Annual depreciation.
To be written off by (——)
How disposed of.
Value extinguished.

The last two columns are, of course, only used after the period representing the life of the machine has expired. A tick placed in the last column—"value extinguished"—shows that nothing more has to be written off in respect of this machine. To ascertain the total amount of depreciation to be written off at the close of the financial year the separate amounts shown in the inventory are tabulated and added together.

If preferred the tabulation can be made at the same time as the entry. In this case a rather wider book is needed, the particulars quoted above being recorded on the left-hand side of a double page, and the right-hand page being ruled with a series of cash columns to be headed with successive years. Thus, if the book value of a machine purchased at the beginning of 1917 is to be extinguished in five years, one-fifth of the purchase price is extended into each of the columns headed 1917, 1918, 1919 and 1920, and 1921. The accuracy of the analysis is proved by the totals, the sum of analysis columns on each page being equal to the purchase total on the corresponding half of the sheet. A summary of the page totals gives the amount to be written off each year.

SIMPLICITY DESIGN DURABILITY WORKMANSHIP The Ford-Smith Machine Company SIMPLICITY DESIGN DURABILITY WORKMANSHIP

Machines of Highest Grade for Shop and Foundry

Ford-Smith Grinders—

A few of our lines are

General Purpose Shop Grinders.
Floor Grinders (all sizes).
Water Tool Grinders (Belt or Motor Driven).
Bench Grinders.
Polishers and Buffers.
Plow Grinders and Disc Grinders.
Swing Grinders and Special Grinding Machines.

Our Catalog is yours for the asking.

The Ford-Smith Machine Co., Limited

Hamilton, Ontario, Canada

SILICA WARE FOR HIGH TEMPERATURE USE

In a recent lecture before the Royal Society of Arts, Mr. C. R. Darling stated that one of the most important products of the electric furnace, because it was essentially a British product, was vitrified silica ware. The manufacture of this material was due to Professor Boys, who first obtained fine threads for suspension galvanometers by fusing quartz. Later on Shenstone took up the work, and fused rock crystal. This material had remarkable properties, the greatest of which was that it could be made white hot and plunged into cold water without ill effects. This resistance to change of temperature was due to the fact that it had scarcely any coefficient of expansion, and in that respect had a great advantage over glass, which it resembled in appearance. It was in consequence used to a great extent for making furnace linings, and all classes of laboratory apparatus, and apparatus which had to withstand great changes of temperature. It was now possible to make in vitrified silica anything that could be made in glass, whilst many things that could not be made in glass could be made in vitrified silica. In its manufacture it was worked in the manner as glass, except that a oxy-hydrogen blowpipe was used instead of air blowing. The rock crystal which was necessary to produce a silica which was clear as glass was expensive, and attempts had been made to use high-grade sand. They had been successful to the extent that the resultant material had the essential properties, but it was not so clear. Nevertheless, it was very much cheaper to manufacture. This particular class of material was used for the muffles of small electric furnaces in which a temperature of 1,000 deg. was maintained.

The great developments which had taken place in the manufacture of calcium carbide were also due to the electric furnace, and they, in turn, had rendered possible the great acetylene industry. Prior to the war we used in this country 30,000 tons of calcium annually of which only 2,000 tons were made here, the remainder being imported.

◆

ONTARIO is estimated to be now supplying 80 per cent. of the total world's production of nickel, which is now six times as great as in 1900. The richest nickel deposits so far discovered are those at Sudbury. The island of New Caledonia in the South Pacific, formerly yielded 65 per cent. of the total output.

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Advertisements under this head are charged at the rate of two cents per word for first insertion and one cent per word for subsequent insertions. Minimum orders $1.

WANTED — A USED POWER ELEVATOR, capacity 1,500 to 2,000 pounds. Canadian Hart Wheels, Ltd., Hamilton, Ontario. (c7f)

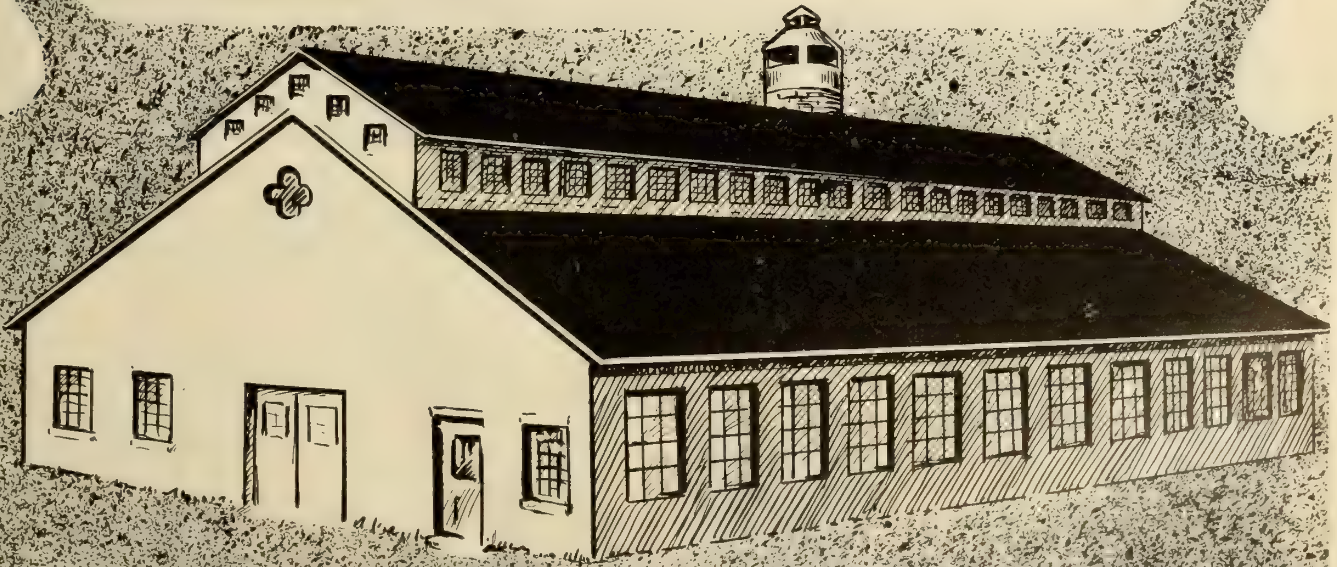
Everything—Positively Everything Needed in your Foundry

When in the market for FOUNDRY SUPPLIES or EQUIPMENT do not forget that we are prepared to handle your requirements in a business-like way.

Agents for Whiting Cranes, Cupolas, Core Ovens, etc. We also sell Glutrin Core Binder and Hytempite high-grade fire cement.

The Dominion Foundry Supply Co., Ltd.

Toronto Montreal



Milton Hersey Company, Ltd.

CONSULTING FOUNDRYMEN

MONTREAL **WINNIPEG**

SERVICE

OF

Expert Analysts for Routine Analyses.

Practical Metallurgists and Foundrymen
for Your Foundry Problems.

An Economical and Effective Service that
Yields a Dividend to all users.

The Largest and Best Equipped Commercial Laboratory in Canada

USE KAOLIN

For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

It will save your fire brick and the time of your men.

Whitehead Bros. Co.

Providence
New York
Buffalo

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.

"702" Ceylon Plumbago

Rillton Ingot Mold Blacking

Peerless Perfect Parting Compound

ESSO
TRADE MARK REGISTERED

Rillton Brass Cleaner

Esso Plumbago Core Wash

No. 702 Pure Ceylon Plumbago
Rillton Sea Coal Facing
"Kantbebeat" Core Compound
"Bull Dog" Core Wash
"Esso" Linseed Core Oil

"All These Brands stand for Efficiency and Reliability"

Bull Dog Core Wash

Car Wheel Core Compound

EVERYTHING YOU NEED IN YOUR FOUNDRY

The S. Obermayer Company

FACTORIES:
Chicago Cincinnati Rillton, Pa.

WAREHOUSES:
Pittsburgh St. Louis Denver Los Angeles

OFFICES:
Milwaukee Philadelphia Detroit

Esso Cream Soapstone

No. 440 Mica Core Wash

Canadian Representative: E. B. Fleury 1609 Queen St. W., Toronto, Ont.

XX Peerless Core Oil

Rillton Sea Coal Facing

LIEUT.-COLONEL ———, the writer of the following letter, abandoned a lucrative business and joined the Canadian forces in August, 1914. He has never been out of uniform since. He has been in some of the heaviest fighting; has been wounded several times; was given up by the doctors; recovered and is again at the Front; was offered command of a brigade. He is regarded as a man of so much importance that he has been guaranteed a sure seat in the House of Commons and will be one of the chiefs, if not the leader, in the returned soldiers' movements in Canada.

Lt.-Col. John Bayne Maclean,
Toronto, Canada.

France, April 5th, 1918.

Dear Colonel Maclean:-

Yesterday I had handed to me by Captain——————a copy of MacLean's Magazine with your article on ''WHY WE ARE LOSING THE WAR,'' which has been sent to him by a lady from Edmonton because of the reference made in it, no doubt, to . . . . I have read the article over carefully and so have many of my officers and I thought I ought to let you know how deeply impressed we all are with your array of facts and arguments and the manner in which you have marshalled them together in a brief that should bring envy from the best legal minds in Canada.

For a long time I have been filled with the same ideas with reference to the infantile handling of the great affairs of State by the big men of our country and as one who has been brought up in the greatest awe and respect for those high in authority in England I tried to fight against the gradual turn my mind and heart was taking towards these great leaders. Furthermore, being a soldier, I felt it would not be in keeping with my duty to make comment or criticize those in authority and perhaps also I lacked the courage lest I might bring about my ears criticism which must always follow attacks upon big men. I believe there are many others who have shared the same views and for the same reasons refrained from ''Talking out in Meetings.'' You have stepped into the breach and taken upon your own shoulders the burden of a whole people and in doing so I realize what it will mean to you and the courage and fearlessness which you must have in order to have taken this step. I know of no other man who has so boldly set before us Britishers our own case. You will, no doubt, having attacked these great leaders, find yourself in a maelstrom of criticism. You will be called disloyal and you will be vilified and abused, but the truth of your statements cannot be gainsaid and you must eventually stand out as a great and fearless citizen who was not afraid to place himself in jeopardy, that EVEN YET A ROTTEN SITUATION MIGHT BE TURNED INTO VICTORY BY PROPER HANDLING.

The history of this war has been a history of bungling on the part of the higher ups, interwoven with a history of devotion, loyalty and doggedness on the part of men in the ranks, which can never be excelled. It has been one continual panorama of ''light brigade'' episodes and our brave men still go on fighting knowing that ''someone has blundered,'' yet feeling that blunder or no blunder, we must fight and fight on that civilization may be preserved and British traditions maintained.

Some sections of the public here abuse Northcliffe, Lloyd George and Beaverbrook but having watched things closely for a few months I have come to the conclusion that in these three men and their associates lies the future of the British Empire. The old regime is fighting and dying hard. Incompetency is also tenacious and hangs on doggedly to the high positions where it has been entrenched for so many years in British public life. A few brilliant charges like yours will start such an onrush of public opinion throughout the Empire that sooner or later he will be dislodged, and brains having taken his place, we may look for results. Until that time comes, we need not hope for a change in the present state of affairs.

OUR MEN MUST HANG ON FOR THE TURN OF THE TIDE IN THE BRITISH PUBLIC LIFE FOR AT THE SAME TIME THERE WILL BE THE TURN OF THE TIDE TOWARDS VICTORY IN FRANCE.

Faithfully

Signed.................................

Commanding.............................

This letter was not marked "private," but for good reasons the name is temporarily withheld. If desired it will be given in confidence to Sir Robert Borden or Sir Wilfrid Laurier. MACLEAN'S MAGAZINE and THE FINANCIAL POST have outstripped all other Canadian newspapers and magazines in information on the big war and political problems of special interest to business men. Address MacLean Publishing Company, University Avenue, Toronto, Canada.

ANODES

Any style or shape
Quality Guaranteed

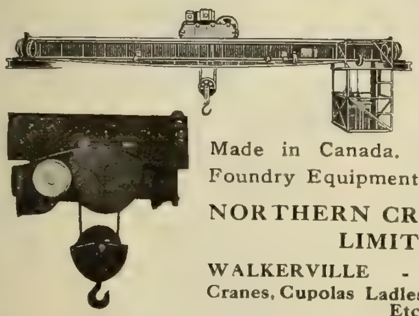
Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In
Brass
Bronze
Copper
Nickel
Tin & Zinc

CRANES



Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS
LIMITED
WALKERVILLE - - ONTARIO
Cranes, Cupolas Ladles, Hoists, Tumblers
Etc.

Are You Satisfied

with the results in your core-room?

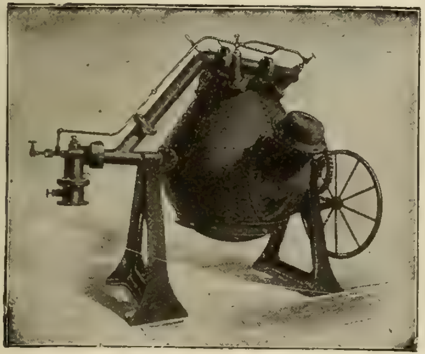
Perhaps you have never investigated the merits of a good Vent Wax.

BUFFALO BRAND Vent Wax is used almost universally to vent all kinds of cores.

Ask your supply house or write us for a sample and circulars describing this material.

Put up on octagon cardboard spools with the "Buffalo" imprint.

United Compound Company
228 Elk St., Buffalo, N.Y.



The Hawley-Schwartz Furnace

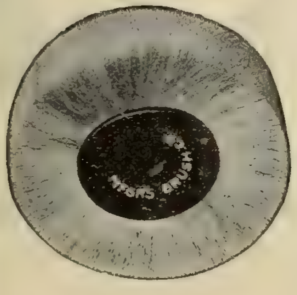
The Only Perfect Melter

All metal from 50 lbs. to 10,000 lbs.

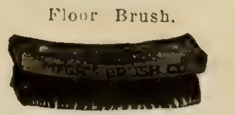
Is Absolutely Uniform

Write for catalog and complete information

The Hawley Down Draft Furnace Co.
Easton, Penn., U.S.A.



Floor Brush.



Highest Quality
Foundry Brushes

We can meet every foundry brush requirement on the shortest notice. You can rely upon our lines to give the best of satisfaction from every point of view. Get your next supply from us—or give us a trial order.

The Manufacturers Brush Co.
CLEVELAND - OHIO
19 Warren St., New York

Bent Handle Washout.

Shoe Handle Washout.

Stone Brush.

Fearless and Entertaining

This is the most momentous time in history, and you want your reading to keep you abreast of what is happening in the world. You want articles that are timely, vital, fearless. Here's what is offered in June MACLEAN'S:

Must the British Empire Cease to Exist? Must all nations, as separate nations, cease to exist? Read what is said on this subject by - - - - - - - - - **H. G. Wells**

When a thousand guns play on a single trench, what happens in that trench? A powerful description by one who lived through it by - - - - - - - - **Geo. E. Pearson**

A soul-stirring ballad of the trenches by **Robert W. Service**

Galvanizing the Government at Ottawa. An article on the work of the Ginger Group.

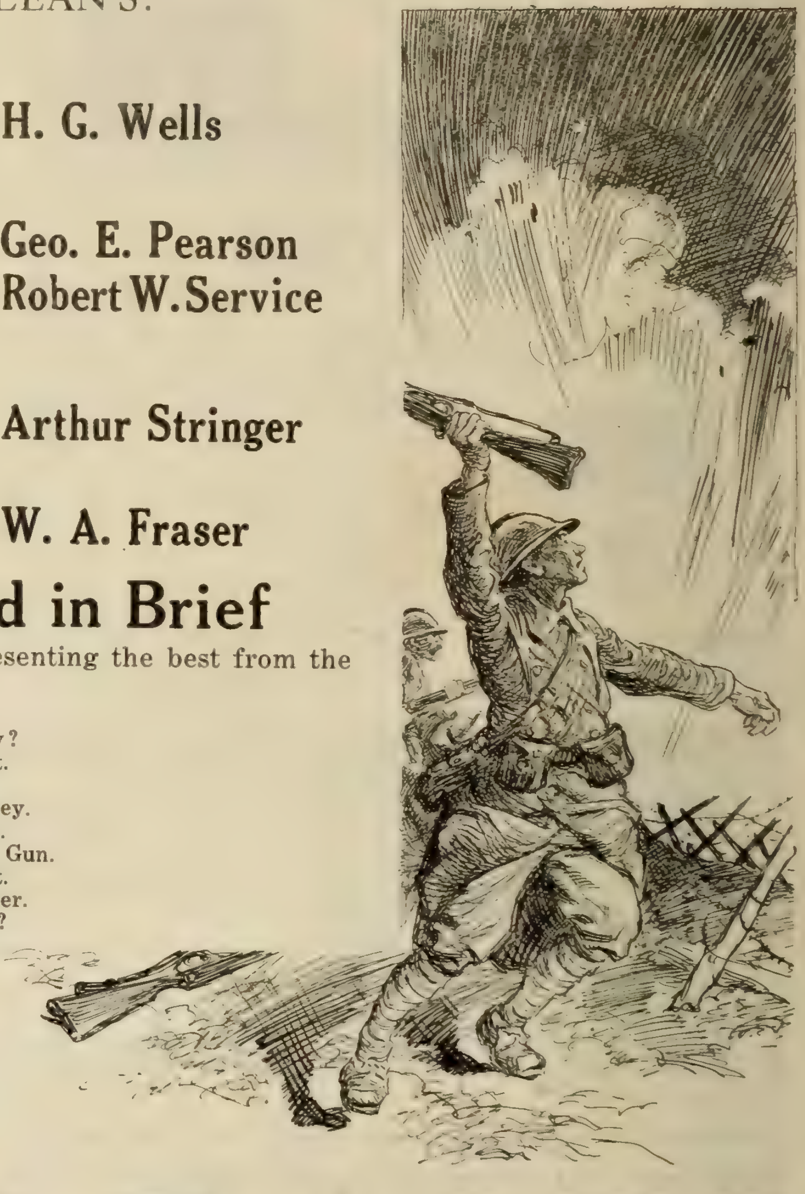
A gripping mystery story by - - - **Arthur Stringer**

The Three Sapphires—A new serial story combining Hindu mystery and war intrigue by a great Canadian novelist. **W. A. Fraser**

News of the World in Brief

The following articles are reprinted as representing the best from the best magazines the world over:

Is This Germany's Plan?
Is Japan Seeking a New Ally?
How Allied Victory Was Lost.
Is Foch Another Napoleon?
How Germany Annexed Turkey.
The Death of General Maude.
That Mysterious Long Range Gun.
How Bolo Pasha Was Caught.
The World is Growing Warmer.
Super-Kaiser or Little Willie?



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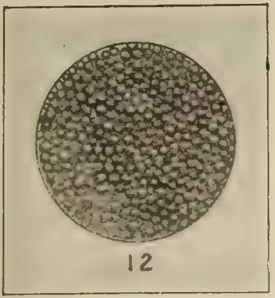
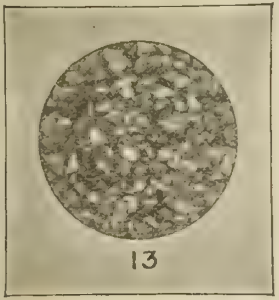
"Canada's National Magazine"

At All News Stands - 20c.



12

Chilled Shot



13

Diamond Grit

CHILLED SHOT

DIAMOND GRIT

TWO METALLIC ABRASIVES THAT "CAN'T BE BEAT" FOR CLEANING STEEL, MALLEABLE IRON AND ALUMINUM CASTINGS, AND they are many times more efficient and economical than the best sand you can buy.

A trial will convince you.

Prices low. Shipments prompt. Free samples for the asking. Write for trial sample to-day.

HARRISON SUPPLY COMPANY
5-7 Dorchester Ave., Extension
BOSTON, MASS. - - - U.S.A.

Canadian Representatives: Ritchey Supply Company, 126 Wellington St. West, Toronto, Ontario, Canada.

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

GET OUR SERVICE INTO YOUR SYSTEM

Specialists in analyzing, mixing and melting of Semi-Steel, Grey and Malleable Irons.

The Toronto Testing Laboratory, Limited
160 Bay Street, Toronto

Trade Mark
Reg. U.S. Pat. Office

ANGULAR GRIT---THE SCIENTIFIC METALLIC BLASTING ABRASIVE

that reduces sand blast costs and conserves labor. ONE TON of ANGULAR GRIT will do as much work as carloads of sand; its sharp cutting points makes it superior to all other abrasives. Write for samples.

PITTSBURGH CRUSHED STEEL CO., Sole Manufacturers
PITTSBURGH, Pa , U.S.A., Established 1888
Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal, Canada.

Trade Mark
Reg. U.S. Pat. Office

BUYING CRUCIBLES IS BUYING SERVICE

Buying anything but the best is false economy—a waste of money

McCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.

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Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
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Can. Fairbanks-Morse Co., Montreal, Que.
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CAR MOTORS
Can. Ingersoll-Rand Co., Montreal, Que.

CARS, CORE OVEN AND FOUNDRY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, ETC.
United Brass & Lead, Ltd., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
United Brass & Lead, Ltd., Toronto, Ont.
W. W. Wells, Toronto.

CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Fanner Mfg. Co., Cleveland, Ohio.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Standard Equipment Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.

CLAMPS, FLASK
Obermayer Co., S., Chicago, Ill.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

CRANES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
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W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N J
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
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Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

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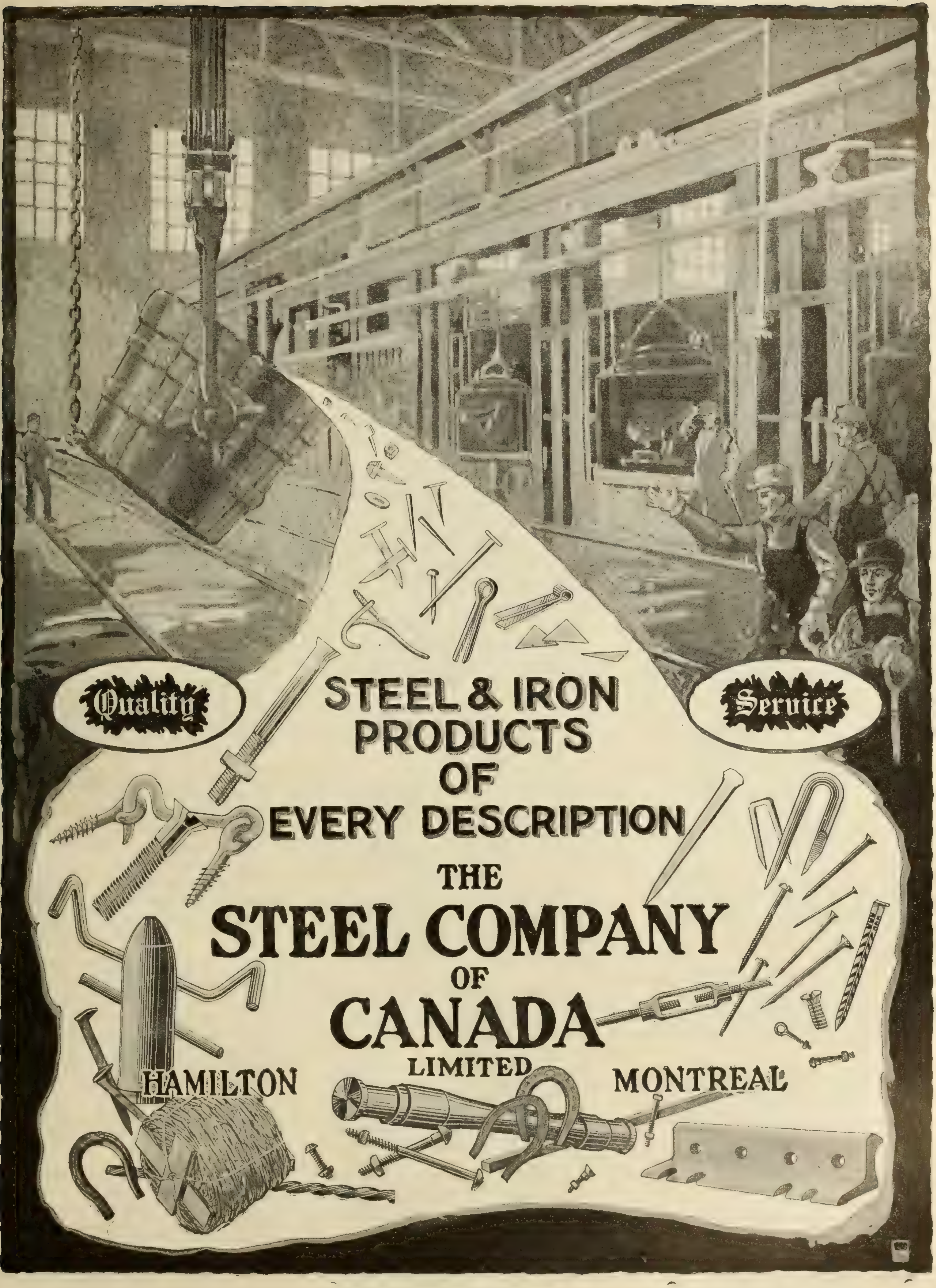
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont



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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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U. S. Silica Co., Chicago, Ill.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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McLain's System, Inc., Milwaukee, Wis.

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Woodison, E. J., Co., Toronto, Ont.

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Obermayer Co., S., Chicago, Ill.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Ingersoll-Rand Co., Montreal, Que.

GRINDERS, DISC, BENCH, SWING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

GRINDERS, RESIN
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRIT, ANGULAR
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Can. Ingersoll-Rand Co., Montreal, Que.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, HAND, TROLLEY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.

IRON FILLER
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Midland Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
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McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

MAGNETS
Ding's Magnetic Separator Co., Milwaukee, Wis.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.
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MIXERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Castings of Ottawa, Ltd., Ottawa, Ont.
Davenport Machine & Fdry Co., Davenport, Ia.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Midland Machine Co., Detroit.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP EQUIPMENT.
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLUMBAGO
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PLATING AND POLISHING SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Ingersoll-Rand Co., Montreal, Que.

PULLEYS, MAGNETIC
Ding's Magnetic Separator Co., Milwaukee, Wis.

RAMMING PLATES AND MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RETORTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

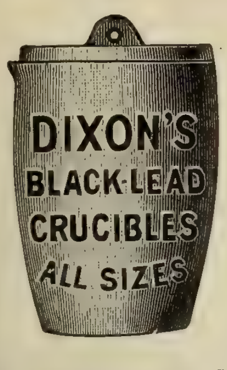
RIDDLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

SANDBLAST ABRASIVES
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST ACCESSORIES
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.



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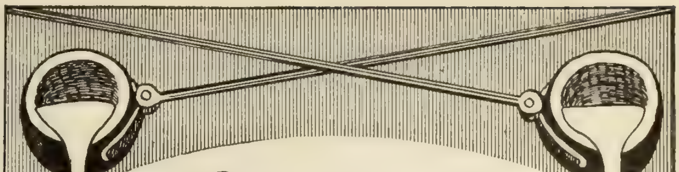

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mott Sand Blast & Mfg. Co., Brooklyn, N.Y.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST GRIT AND SHOT

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND BLAST SAND

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
U. S. Silica Co., Chicago, Ill.
E. J. Woodison Co., Toronto.

SAND BLAST SHOT

Globe Steel Co., Mansfield, Ohio.
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago, Ill.

SAND CONVEYING MACHINERY

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Sly, W. W., Mfg. Co., The, Cleveland, O.
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Feed your foundry refuse to

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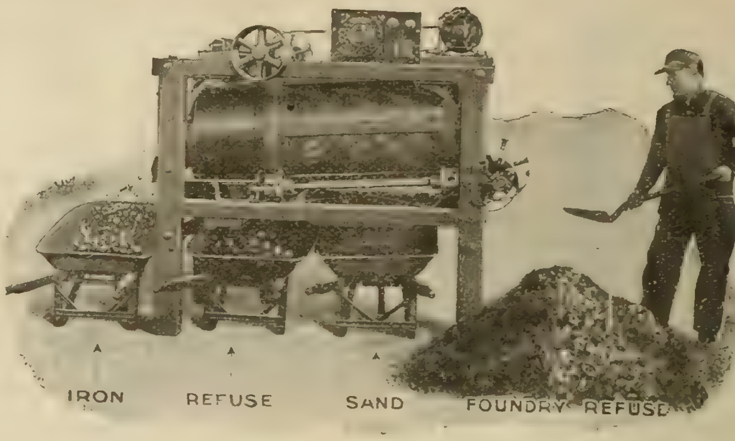

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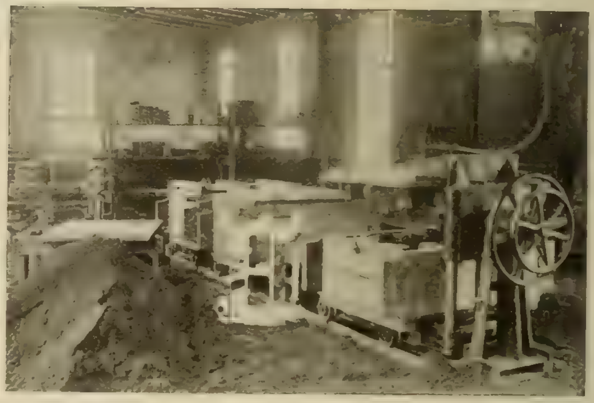

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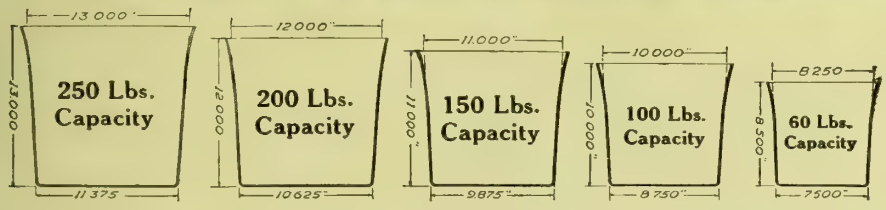
SAVE ON STEEL BOWLS and SHANKS



The United States Goverrnment is commandeering the steel of the country. There will shortly be a scarcity for other than war purposes.

I have the largest stock of Steel Ladle Bowls and Shanks of any house in America. These were purchased when the price of steel was less. And so comes about an unprecedented opportunity—I invite attention to my Bowls and Shanks at *especially low* prices.

Now is buying time. Now is the moment to lay in an adequate supply for present and future needs.

When my *present stock* is reduced and the price of steel *goes up*—as steel men say it will—there will be *no more* available at prices given here. Purchase *now*. Send in your order when you read this.

Total your requirements for a year or more and make requisition by *return mail.*

Buy at these prices *to-day*—to-morrow they may be higher:

Stevens Stamped Steel Ladle Bowls

	Future price owing to the advance in steel.	My to-day price.
60-lb. Capacity	25% to 100% increase..	$2.25
100-lb. Capacity	25% to 100% increase..	3.95
150-lb. Capacity	25% to 100% increase..	4 25
200-lb. Capacity	25% to 100% increase..	4.85
250-lb. Capacity	25% to 100% increase..	6.00

Stevens Cast Steel Ladle Shanks

	Future price owing to the advance in steel.	My to-day price.
60-lb. Capacity Ring Handle	25% to 100% inc.	$ 3.00
100-lb. Capacity Single End	25% to 100% inc.	8.60
100-lb. Capacity Double End	25% to 100% inc.	10.75
100-lb. Capacity Double End Swivel	25% to 100% inc.	13.50
150-lb. Capacity Single End	25% to 100% inc.	9.00
150-lb. Capacity Double End	25% to 100% inc.	11.15
150-lb. Capacity Double End Swivel	25% to 100% inc.	13.75
200-lb. Capacity Single End	25% to 100% inc.	10.45
200-lb. Capacity Double End	25% to 100% inc.	11.60
200-lb. Capacity Double End Swivel	25% to 100% inc.	14 25
250-lb. Capacity Single End	25% to 100% inc.	9.90
250-lb. Capacity Double End	25% to 100% inc.	12.00
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Outlast Three of the Ordinary Kind

My extra heavy Steel Bull Ladles are known and used both here and abroad—wherever there is a foundry—and will outlast three of the ordinary kind.

Less Fatigue. Easy on Labor. Steel is lighter than iron. Ladles will hold more and workmen will carry more all day than is possible with the other kind.

Extra Strong Material. Steel is stronger than iron. By my process it has been found practicable to use stronger and thicker material. One bowl will outlast two or three of the old kind.

Absolute Uniformity of Size. Bowls were formerly made by the hand method with a sheet of steel rolled—and riveted or welded. By this method it was impossible to obtain perfectly round bowls, nor were any two exactly alike. Stevens Stamped Steel Ladle Bowls are pressed from a single piece of steel and do not vary one one-thousandth (1 1000) part of an inch.

Always Fit the Shanks. Bowls of the old style, varying in size, often poorly fit the shanks, especially if purchased on different orders at different times, or from different sources. Stevens Stamped Steel Ladle Bowls are always a perfect fit.

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Always Fit the Bowls. The bands are made of steel castings—made to fit Bowls at eactly the right point—and are always the same. Whether bought to-day or five years hence they will always fit and fit perfectly.

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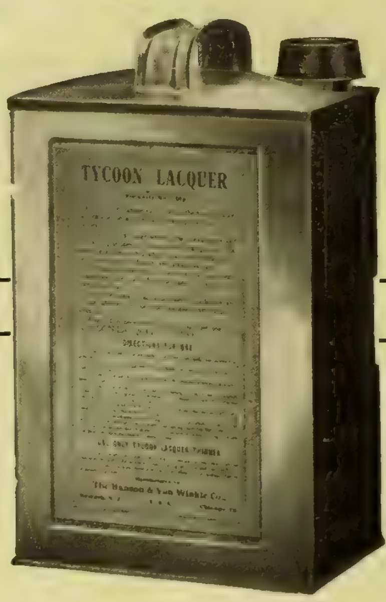

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TORONTO - ONTARIO

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A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, JULY, 1918 No. 7

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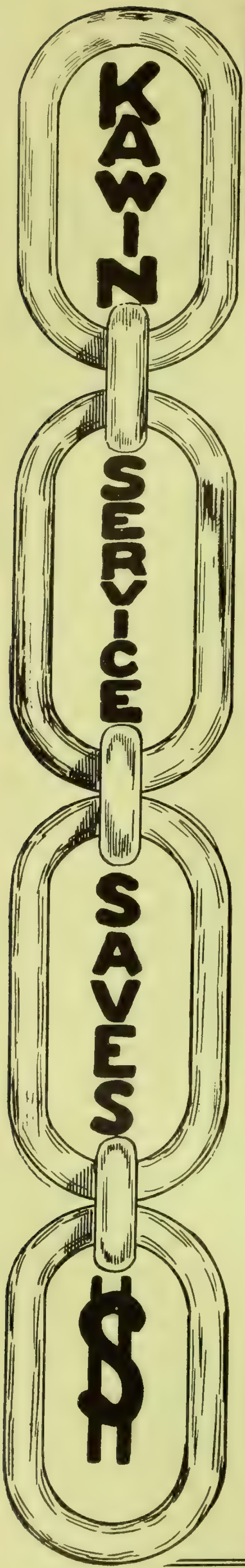

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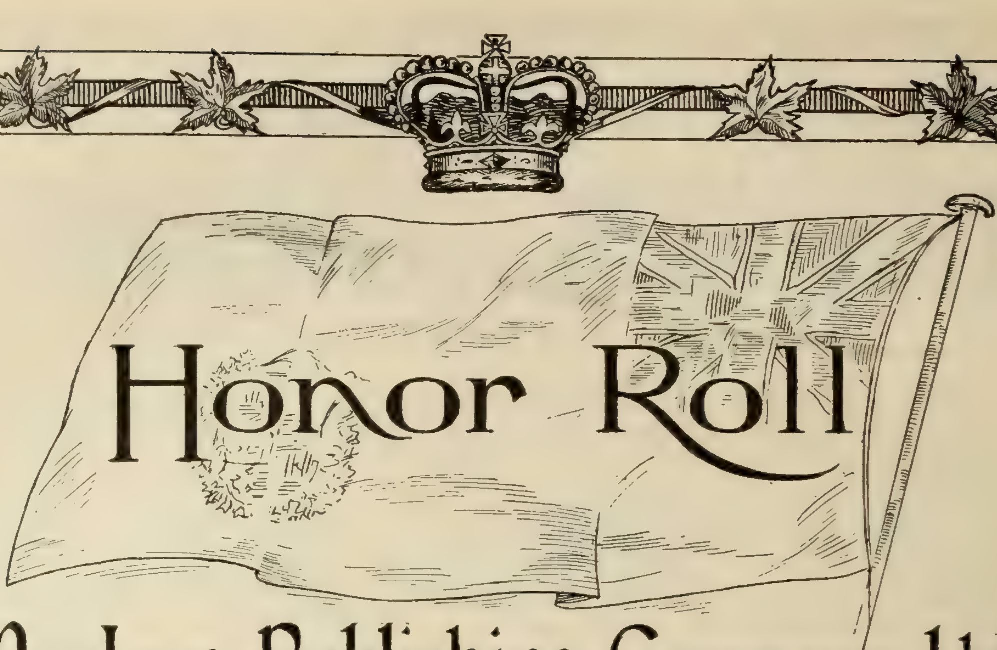

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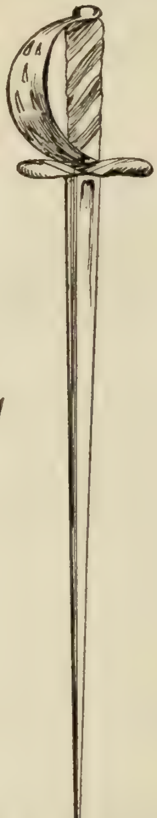

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Two types are illustrated below—one a single chamber design and the other a double-chamber design.

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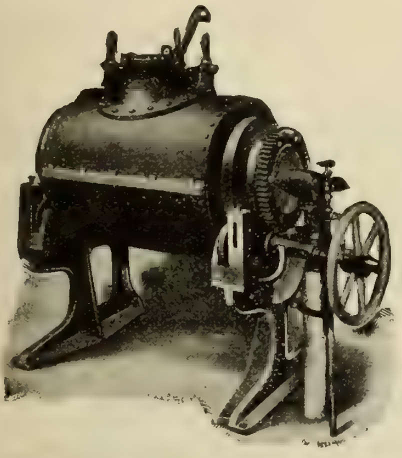

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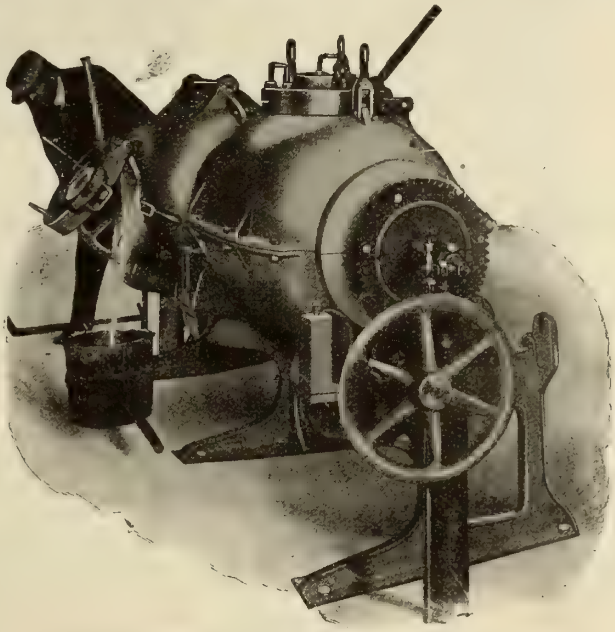

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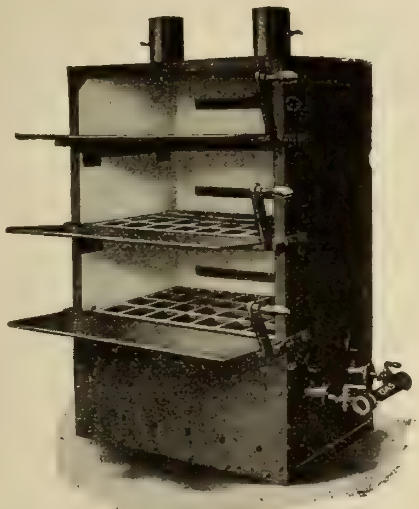

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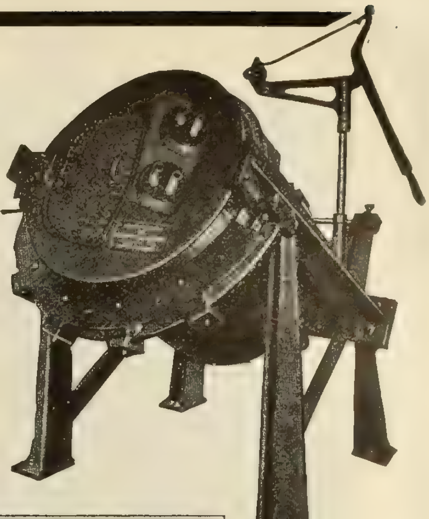

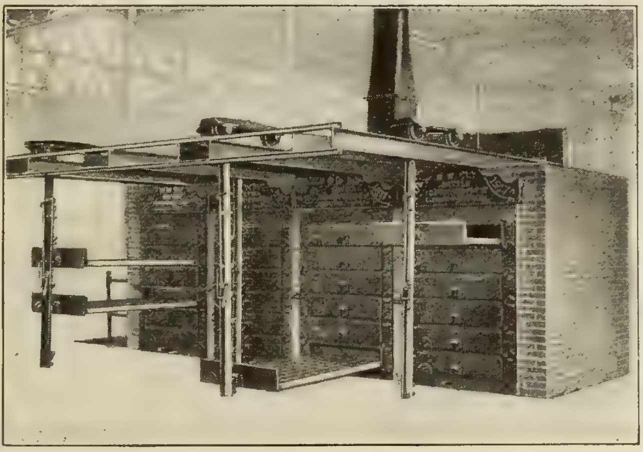

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A Message to Canadian Foundries

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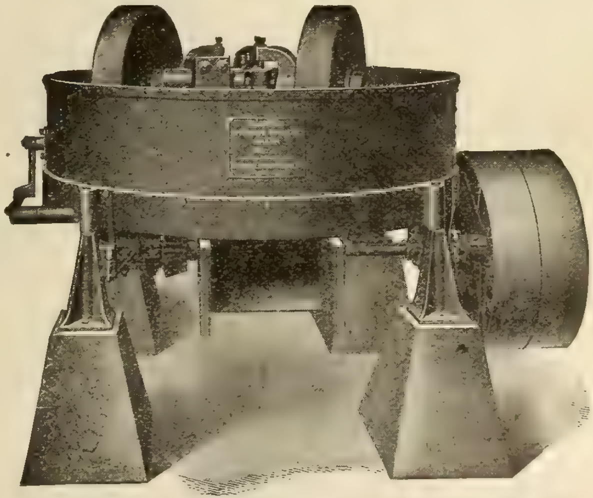
Saves Both Sand and Labor

Improves the quality of the castings.

Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



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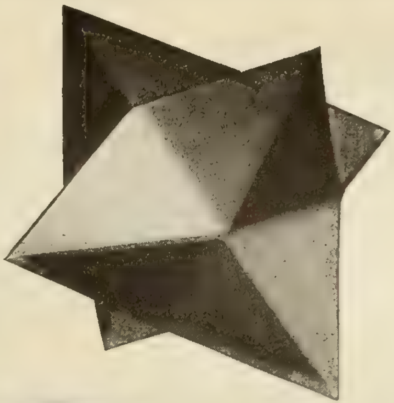

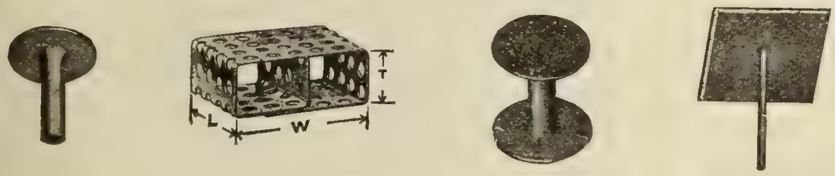

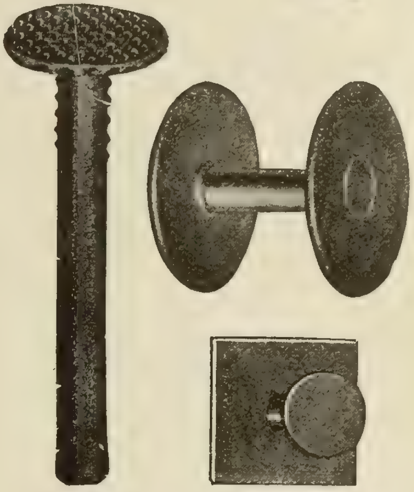

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FASTER WORK
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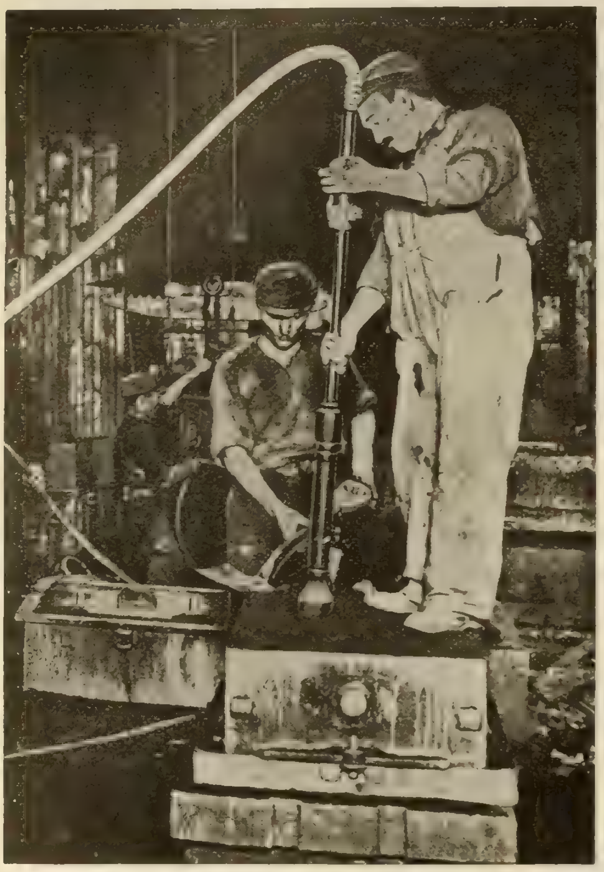

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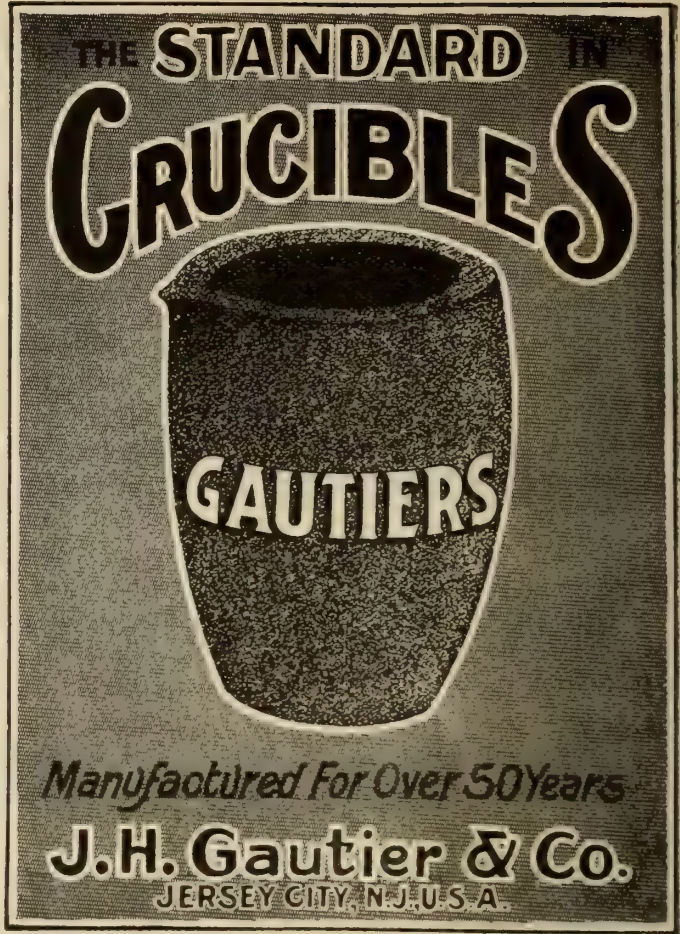
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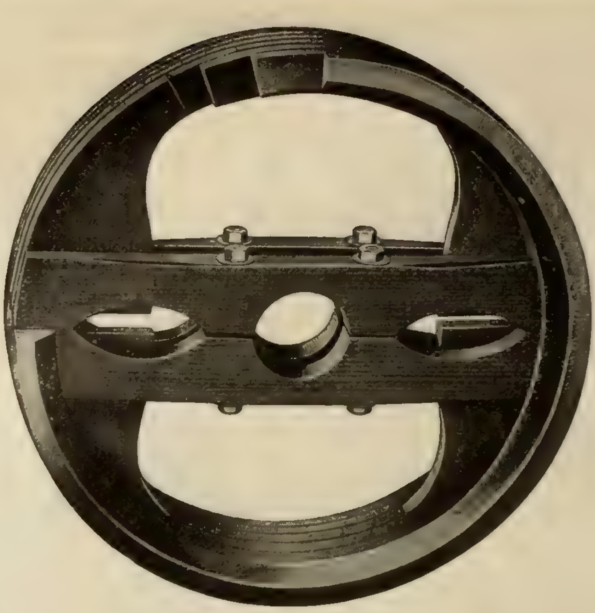

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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Some Notes Regarding Foundry Cost-Keeping and Methods*

By M. H. Potter

Many factors enter into the problem of accurately determining the cost per pound of metal melted and while a cost system will not alone insure success it is one of the essential features of every successful plant, maintaining as it does a close check upon the general plant efficiency.

ONE of the discouragements to foundrymen is the failure to secure results from cost systems they have tried, due generally to incompetent professional and practical advice. It is difficult to devise and install a foundry cost system and other foundry methods that do not involve extravagant expenditures to maintain. However, the foundryman needs a cost system; it is necessary to foundry efficiency, economy and progress. The system must be simple and plain, accurate and practical and so valuable that a foundryman who once gets such a system never regrets it nor begrudges the money he spent for its installation.

The Science of Management

No business is made a success by the cost system alone, though business success is rarely secured to its full extent without the aid of a cost system. It maintains the high degree of efficiency through intelligent, energetic and enthusiastic management, made practical by good organization, permanent policies and business integrity. Let us consider the science of management which permits of a sane, sensible and orderly management rather than scientific management, or one securing efficiency by purely scientific methods which are expensive to execute. In these days of business activity, with competition growing keener day by day, it is necessary for executives to have all the knowledge practically and economically obtainable relating to current operations of their business; the best way to secure this knowledge is through the operation of a dependable cost system that gives the executive control of his business. The cost system may rightly be called the mainspring of the business, but it must be practical. When installed its value depends largely upon the understanding the chief executive of the business has of its principles and its possibilities.

Accurate Cost Control

A foundry cost system can be devised to fit the foundry for which it is designed so that it will take care of every disbursement for material and labor, whether it be a direct or productive item or an indirect or non-productive charge. These disbursements must be separated or classified to divisions or departments of the foundry to show current costs of departments for efficiency in management, and also separated and charged to classes of castings or to individual orders to show complete cost of production by classes or by special orders. All of this must be tabulated and presented weekly.

The productive departments of an iron foundry are classed as follows:

A—Cupola.
B—Core room.
C—Molding.
D—Cleaning and chipping.

The non-productive or indirect expenses, overhead charges, or burden are:

Superintendent and foreman.
Foundry clerks.
Shipping.
Yard man.
Crane men.
General laborers.
Machinists, carpenters and blacksmiths.
Freight and cartage.
Pattern repairs and renewals.
Bad or defective castings.

Through the medium of standing order numbers to which they are charged and tabulated for distribution to the productive departments and classes of castings as a part of the cost, these expenses are taken care of. They inform the superintendent or executive in charge, currently, of variations in this class of disbursements for prompt action when any particular item or items show unusual increases. Cost systems may furnish information of little or no value, possibly vital information is only computed once a year, or if an attempt is made to get at monthly results, the statements are furnished so long after the last of the month as to make them almost valueless. This is one of the reasons why foundrymen are so adverse to cost keeping systems.

A cost keeping system to be efficient must consider the needs of the business in question, it must be planned to make possible a rapid comparison and analysis of pertinent information, being readily understood and quickly operated so that the facts can be furnished promptly, that it must be arranged so that unnecessary work and entries will be done away with, in addition to which it should be designed to furnish the information so that it can be properly classified.

Scientific price making is a matter of accurate costs. Therefore, should one foundryman find that he is consistently higher in his bidding than another, it can only mean one or both of two things:

1. He is not operating efficiently.
2. He is adding too much profit to the costs.

By a proper costing arrangement a foundryman can intelligently check up his weak spots, can determine where they are and correct them. This will mean lower costs and as a result a lower price at the same rate of profit he figured before. Uniformity in cost keeping means intelligent competition, as well as furnishing a means for increasing operating efficiency.

As a matter of fact, the requirements for cost control are:

1. Costs of labor and material must be accurately determined and properly classified.
2. The expenses or burden must be carefully considered and so classified as to give the executive the opportunity of studying each element separately.
3. Apportionment of expenses to production must be arranged for on some basis as will not make the cost of heavy work too low, or the result will be lost sales on heavy work and plenty of light work at losing prices.
4. Costs vary with productivity, by which is meant the relative amount produced, per man per day.

Fixed Charges

Light, heat, power, water and protection charges are treated in a manner similar to the other foundry disbursements and are distributed proportionately to the productive departments and classes.

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*See Canadian Foundryman, April, 1918, page 18: "The Organization of an Efficient Foundry Costs System.

The fixed charges, depeciation and interest, fire and indemnity insurance, are absorbed into cost of product, but are shown on the reports separately, for the reason that these items being fixed can not be increased or decreased by act of the superintendent or foreman and should not be included with other items of expenses which can be controlled by the superintendent or foreman according to the degree of efficiency he shows in the management of foundry affairs.

Handled by the usual accounting methods applied to this class of property accounts, but the charges thereto are not absorbed in current cost of product, only their upkeep and depreciation are: Foundry betterments, or permanent investments, such as real estate, buildings, machine tools, general tools, patterns, power transmission, piping, electrical and mechanical equipment, etc.

A cupola report is prepared showing the grades of pig iron melted, with quantity and value of each, and also quantity and value of machinery and foundry scrap to show total melt; from this is deducted the returns and bad castings, which gives the net cost of metal melted. To this is added the cost of fuel and supplies, together with the labor engaged upon the cupola work and the power consumed to give net cost of melt, which is reduced to a rate per pound of metal melted. From this melt and upon the cupola report the pounds of castings produced are shown. This report also shows:

1. Per cent. of good castings to gross melt.
2. Per cent. of bad to total castings.
3. Per cent. of returns to gross melt.
4. The melting loss.
5. The ratio of this loss to melt.

This report is complete and includes every item of cost of cupola operation reduced to a net cost per pound of metal melted from the cupola spout to the ladle, ready to pour for subsequent use in ascertaining cost of castings per pound by classes and in total, or cost of castings by jobs or prices. The report also is decidedly helpful to the superintendent or foreman in measuring the efficiency of this important foundry department.

Similar reports are prepared for the core room, the molding, cleaning and chipping departments, to show cost of operation of these divisions, both for department efficiency and to include in final summary of cost of castings.

Overhead Expenses

The overhead expenses are tabulated in one report to show the disbursements in detail covering this class of cost. This report also shows cost of power, heat, light, etc., and the amounts that are apportioned to cover the fixed charges. Thus all money expended for material, labor and supplies, whether for direct or indirect use, is properly accounted for.

All the reports are summarized on a cost of casting sheet to show total cost of operating by departments and total cost of castings by classes with notations of period or average costs to date for departments and classes. These several reports for the cost statement with every item of cost absorbed are capable of proof with the books of account.

Additional reports in the nature of statistics may be prepared from the cost reports, arranged to show results comparatively as a further guide to the superintendent in his effort to promote efficiency. A statement of comparative results arranges facts developed in the cupola department relating to good castings, bad castings, returns, total from melt, melting loss, total melt, average melt per day, defective castings, cost of metal, ratio of expense to productive labor, average castings per day both good and bad and per molder, and other useful data to indicate to the superintendent how these regular features of the foundry are running along and what variations develop. An analysis of the product and of foundry expenses may also be arranged comparatively to inform the superintendent of variations in these items.

These statistical statements are not actually a part of the cost report, but are most helpful to the management in watching the trend of affairs.

Purchase and Stock Control

Auxiliary to the cost system and in connection with it is the system of stock control which can be operated in a simple manner to properly regulate purchases of material and supplies and to properly govern their use. A stores and stock system not only provides a current inventory, but effectively prevents careless and indifferent buying, overstocking and waste and furnishes a means of inspection of this class of property that is desirable and helpful in the effort to economize in material and supplies.

Reports compiled frequently give the management and executives in direct charge the opportunity to observe irregular developments in cost of operation. For this reason alone such reports are of so much more real value that their cost to maintain need not be considered.

In preparing these reports, the cost clerk is assisted by suitable forms of recording and reporting data from the several departments which he needs for his report. These data comes to him daily on analysis sheets, thus assembling the figures needed for his report each day to further enable him to compile his report at the end of the week promptly and without serious effort.

There is no theory about this system, its practical application has been demonstrated in various large foundries and its effectiveness proven. Its execution does not involve an undue amount of clerical or other expense, on the contrary the system can be operated so economically that a foundryman who desires to know his costs can hardly afford to neglect the installation of the system.

It must be remembered that it takes time and perseverance. Various elements must be reckoned with and various obstacles must be overcome; it must have the support of the executives against all obstacles and objections.

Its elements must be thoroughly understood and it must absorb all items of cost, both direct and indirect. To use cost figures that do not represent the total expenditures for labor, material and expense and which cannot be proven are hazardous to the business. If the figures used do not include these chief elements of cost, selling prices will be made that will not show a profit when the fiscal year's balance sheet is prepared.

It is not difficult to ascertain accurately the amounts expended for direct labor and material, but just how to ascertain the overhead and apportion it equitably and correctly to be certain that all overhead expense is absorbed requires careful study and a knowledge of the subject obtained from years of actual practical experience. That cost keeping is just as necessary to permanent and increasing business prosperity as is good organization, efficient management, adequate equipment and capable workmen, is not fully comprehended by a large majority of industrial owners and managers.

Elements of the System

These elements are:

1. Material—material which becomes part of the finished product.
2. Productive labor. That labor which can be determined by a specific amount or rate and can be directly charged into cost of product.
3. Factory expense. The large number of charges which are necessary to maintain productive labor in the operation of manufacture and which includes all items of indirect labor and all repairs, power, heat, light, etc.
4. Administrative expense. Salaries of executives, office clerks, office expense, etc.
5. Fixed charges: Taxes, fire insurance, indemnity insurance, depreciation and interest.
6. Selling expense. Represents all disbursements for disposing of the product, including branches, agencies, salesmen, etc.

These six elements cover all money expended except for betterments, which add to the investment value, such as new buildings, new machinery, tools and other equipment.

Causes of Foundry Failures

Eliminating such considerations as lack of capital, unwise credits, extravagance and fraud, there are four factors which, whether considered separately or in combination, can cause failure or distress to the concern:

1. Lack of systematic methods.
2. Failure to ascertain correct costs of production.
3. Lack of uniformity when bidding on work.
4. Too many concerns for the requirements.

Such uniformity in ascertaining and compiling costs and making estimates as to insure against wide difference in prices, making possible stable prices without any general agreement or understanding, when bidding is far better than an agreement as to price.

In conclusion it must be remembered

that the real function of a cost system is not merely to record the cost of operations, but to submit data that can be used intelligently to reduce costs; then it performs its duty and becomes the most valuable agent known to promote efficiency. In order to present in an orderly manner, regularly, the facts relating to the business completely, week by week, of the actual current business conditions with exact costs of operations by divisions and departments, a reliable cost system is an important essential.

◆

FOUNDRYMENS' CONVENTION TO MEET IN MILWAUKEE

The 1918 convention of the American Foundrymen's Association and affiliated organizations will meet in Milwaukee the week of October 7, and concurrent therewith will be held the annual Exhibition of Foundry and Machine Shop Equipment and Supplies.

Splendid accommodations are afforded these joint functions in Milwaukee's great auditorium halls and meeting rooms for simultaneous sessions, excellent cafe and dining room accommodations. The alterations that have just been completed provide exhibit space in Machinery Hall of 180 by 245 feet, and in the Arena 100 by 225 feet; all this under one roof and within ten minutes' walk of hotels.

Floor plans showing the layout of the exhibit halls are now being printed and will be mailed the coming week together with application blanks and general information.

These conventions will bring together the members of the American Foundrymen's Association, who represent the gray iron, steel and malleable casting interests of the United States and Canada; the metals division of the American Institute of Mining Engineers, formerly the American Institute of Metals, representing the non-ferrous metal casting and brass and copper rolling mill industries; the iron and steel section of the American Institute of Mining Engineers, representing the blast furnace, steel works and rolling mills, and the American Malleable Castings Association, representing the malleable casting industry.

The men who will attend this congress and who are directly affiliated with every branch of the metal-working trades are probably in closer contact with activities for the conduct and successful prosecution of the war than any similar body of men of any other industry. The subjects of many of the papers, addresses and discussions will bear directly on operations to facilitate production and to speed up the manufacture of ordnance, munitions, ship castings, etc. Never before has such an alliance of simultaneous meetings of such great technical organizations been attempted, the war being the impelling motive that prompted this undertaking.

It has been suggested that the congress be opened with a joint meeting of the members of the four societies, and that speakers of national fame be invited to deliver addresses. They would sound the patriotic note that would underlie the deliberations of the four organizations, which would be continued throughout the week.

The exhibition of all kinds of metal working equipment will incorporate the most recent improvements in machinery to increase production and to supplant the country's constantly declining manpower. In addition it is planned to have an exhibit of war materials representing the output of the metal trades. Such a display will be of tremendous educational value to all manufacturers, the majority of whom have little knowledge of the application of the part or parts which they are manufacturing to the assembled war machine.

◆

RECLAIMING OF CORE SAND

Present labor and transportation conditions, as well as high prices of raw materials, have brought about a deeper interest in the reclaiming for re-use of materials hitherto wasted.

Attempts in other lines, we believe, have been more successful and a revived interest is shown in methods of reclaiming the costly core sand out of oil cores. If it were possible to reclaim the sand for re-use, it would mean a saving in not only the sand alone, but also a considerable amount of binder, and furthermore freight charges, time and labor.

The first method of reclaiming this sand is employed where small light cores are used, such as in radiator columns and similar work. These cores could not be taken out of the castings whole; but by the process of tumbling these castings with the cores in exhaust type tumblers, this core sand can be removed quickly and at very little expense.

For this purpose a separator is installed on the dust main where all the good core sand is deposited, while the dust and burnt sand passes on into the dust arrester. Sufficient pressure on the exhaust fan must be provided to lift the heavy sand into the separator, and this suction of a greater velocity than usual also has the advantage of cleaning the work faster.

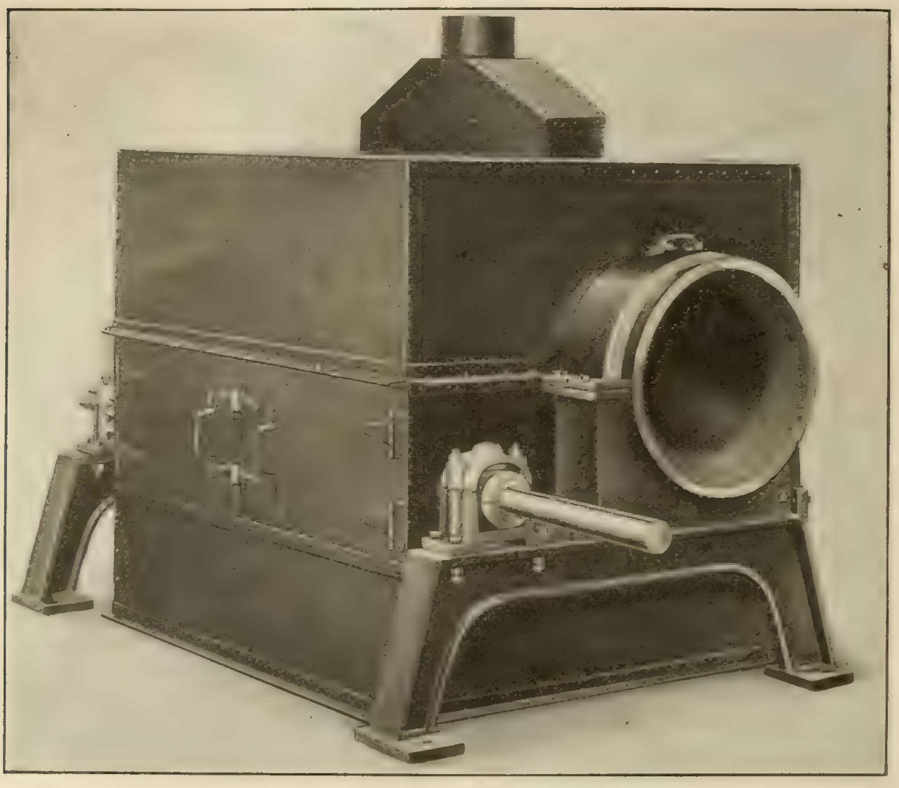
The second method is employed on heavier cores, such as are used in auto-

THE AUDITORIUM AT MILWAUKEE WHERE THE AMERICAN FOUNDRYMEN'S ASSOCIATION AND THE AMERICAN INSTITUTE OF METALS WILL BE HELD DURING THE WEEK OF OCT 7, 1918.

mobile castings and similar work. Cores of this nature generally are shaken out and are not broken up to any great extent. The W. W. Sly Manufacturing Co., Cleveland, Ohio, has designed and put on the market a core crushing mill as illustrated herewith, into which the cores are fed by hand or some mechanical device through the large hollow trunnion. A light crusher on the inside of the barrel grinds the cores, and the fine material falls through the perforation of the mill shell over an automatic wire screen riddle into a hopper underneath. The mill itself answers the double purpose of crushing the material and separating all nails, wires and other foreign matter from the core sand. From the hopper underneath the mill, the fine material is again conveyed by suction into a separator where the heavy good sand is deposited in a storage hopper attached to the separator, while the dust and burnt sand passes into the arrester.

These dust arresters are well-known in foundry circles and are extensively used in connection with sand blast equipment and tumbling mills, as well as in other industries for similar purposes. They vary from other makes of so-called dust collectors in so far as the material to be exhausted does not pass through the fan, and the dust arrester is located on the dust main between the source of the dust and the exhauster. This feature is mentioned here for the following reasons: No dust whatever escapes from the exhaust fan, thereby increasing the life of the fan blades almost indefinitely; the exhaust from the fan can be charged back into the shop for additional ventilation in summer and a saving of heat in cold weather; they also increase the sanitary conditions in foundries and are highly approved of by factory inspectors in the States.

The above mentioned core sand mill is also used in steel foundries for the sole purpose of reclaiming nails, wires and other metal out of the used moulding sand and foundry refuse. All this material is charged into the hollow trunnion and the sand by means of a belt conveyor or bucket elevator is conveyed to a convenient location for carting away. In this manner, the mill is capable of handling 25 to 30 tons of sand per day, separating and saving the valuable metal.



CORE SAND MILL FOR FOUNDRY USE.

LACQUERING BRASS CASTINGS

By M. M.

To produce a simple finish on small brass or bronze castings by means of lacquering it is usual, first to tumble them, unless they have been machined sufficiently to remove the rough surfaces and are free from burrs. The dipping operation merely imparts a clean surface of high color, and is done in a solution consisting of sulphuric acid, 1 gallon nitric acids, 3 quarts, and a handful of common salt. When mixing these acids the nitric acid is put into a stoneware crock and the sulphuric acid poured into the nitric. The two are stirred well and then the salt is added. When replenishing the dip, 1½ parts sulphuric acid and one part nitric acid, and very little, if any, salt is put into it. The castings are cleansed in a hot potash solution and removed therefrom and allowed to cool and dry without rinsing in water. The potash forms a film over the surface of the casting, which, when cool, is dipped momentarily into the acid solution and then rinsed in cold running water. This method obviates conveying an unnecessary amount of water ito the dip. The solution sometimes fails to color when freshly made, and must be allowed to cool.

After rinsing in cold water the castings are passed through clean boiling water, and if of sufficient body to dry quickly, they are dried by swinging in the air, or, if small or thin, they should be dried in clean hardwood sawdust, which must be entirely removed either by brushing or by using a riddle. The castings then should be lacquered with as little delay as possible. As it is essential that the castings should be perfectly clean and free from moisture, drying the castings is best done while still on the wires or wire basket holders, as that plan obviates handling. The thing to aim at is that the lacquering should follow the bright acid dipping as quickly as possible so that the article is coated and hung up to dry as quickly as conditions will permit.

The lacquer should be of such quality as will cover the article without affecting the lustre or obscuring the metal. A good grade of celluloid lacquer will be found to give the best results. It does not crack nor peel, and should be applied by dipping or spraying in a chamber free from dust and at a temperature from 85 to 95 degrees Fahr. If a gold tint or other shade is desired, the coloring should be added in very small quantities. Porcelain or stoneware vessels are best for containing the lacquer while in use, although tin is also used. If rainbow colors are noticeable after the first dip, a second dipping will usually remedy it. If the lacquer becomes thick, a thinner of the same grade as the lacquer should be used. Green-colored drops at the draining point indicate acid contamination, and the castings should be more thoroughly rinsed after bright dipping.

If a drying chamber is used, it should be heated by steam, if work is being done regularly, as then the chances of fire are lessened, the lacquering material being inflammable. If gas is used, extra caution is required, and the chamber should be of sheet metal properly ventilated. The work should be dried slowly in the open air until all dripping ceases before being placed in a drying chamber. When the coating has set and dried the temperature of the heater may be raised and the lacquer will thus become harder, tougher and practically non-porous.

FOR etching brasses and bronzes, a few drops of a strong solution of hydrogen peroxide are added to a very dilute solution of chromic acid. The specimen is immersed and kept moving in the solution for a few seconds; it is then removed and washed immediately in running water. The reagent is said to be equally satisfactory for all brasses and bronzes.

The Stripping Plate Machine: Inception and Development-II.

The influence of machinery on modern production has been almost as marked in the foundry as in other branches of industry. The stripping plate machine has a long record of success and usefulness, and the following is from the Service Bureau Bulletins issued by the Committee on Foundry Methods, National Founders' Association. The details of both machines and work are clearly described and form an instructive record.

Patterns

The best metal to use for stripping plate patterns is cast iron. This metal requires a little more care to keep clean and polished but well repays for the extra care.

A good preparation to polish cast iron patterns is made from one part beeswax and two parts bayberry wax cut into a paste with turpentine. A thin coat of this preparation should be put on and the patterns and plate and polished with a stiff brush every night when the job is running and also before putting the patterns in storage. If cared for in this way cast iron patterns will keep sharp edges and remain in good condition longer than brass, aluminum or white metal.

Handles and Trunnions for Flasks

Loose handles turned from soft steel and made to fit an eye-lug that has been cast onto each side at the four corners have some advantage over the handle cast onto the flask, for flasks that require two men to handle.

The flask will occupy less space on the floor, thus saving room. The cast handle will get broken off at times, while the lug never does. The cast handle projects into the gangway and moulds are frequently ruined by men hitting these handles and jarring the mould; the lug is never in the way.

The lug or handle should be so placed that the minimum effort is required in rolling the drag over. Ram up the flask, then balance it on its side to learn where the centre of gravity is located. Then place the handle or lug at that point.

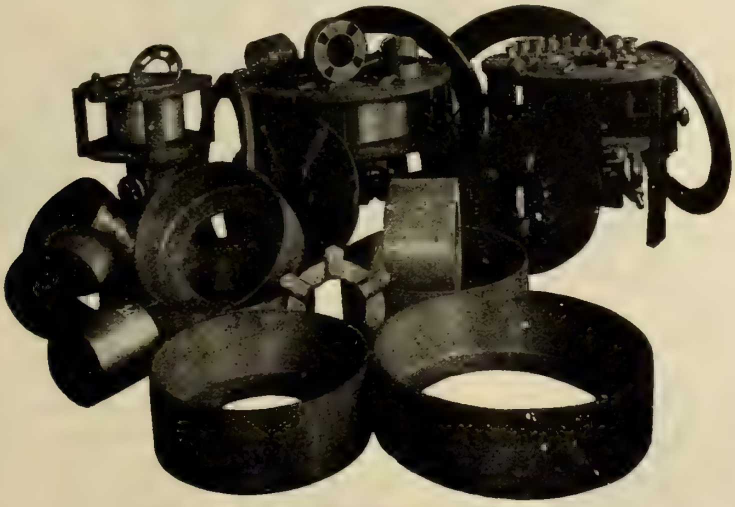


FIG. 9—PULLEY MACHINES AND PATTERNS.

If the mould is handled by hoist it may require both handles and trunnions. The handles to be used in handling the empty flask, and the trunnions when it is rammed up. The trunnions should be at the centre of gravity when the flask is rammed up. It should roll over with little effort but not of its own weight.

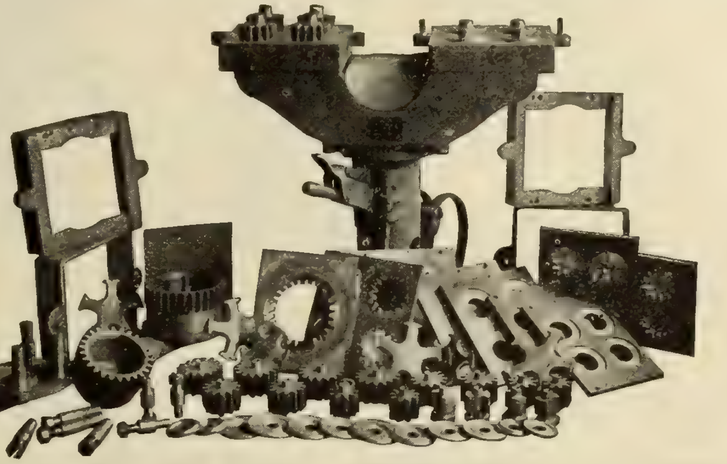


FIG. 10—SMALL GEAR MACHINE. COPE AND DRAG ON ONE MACHINE.

The trunnion should be of such shape that the bail will stay on and in place and care should be taken that it does not weaken the flask by drawing when the flask is cast. The bail should be substantially made so it will stand hard usage and not become bent. It should be so designed as to be quick and sure in operation and not jar the mould in rolling or handling.

The hoist should be a quick acting hoist and should hold the load at any point when required; it should also move slowly when necessary, as in closing the mould. The air hose should be arranged so as not to hang in the way of the moulders and so it does not require any effort to move on the wire, while placing the flask on the floor.

A spare hoist that is kept in repair and ready for instant use is also necessary. The hoist will get out of repair and unless a spare one is at hand the moulding floor remains idle while repairs are being made.

Bottom Boards and Clamps

Where the job requires a bottom board it should be made substantial with strong battens so placed that the board will not spring if the floor is uneven and thus cause a crooked casting. Iron plates are used in many shops and give excellent results. The clamping of the board should be quick and secure. A quick and positive clamp is made from ¾-inch round soft steel bent at right angles at each end, one end should be about 2½ inches long and the other end 1 inch long. Drill ⅞-inch holes through the flask where the clamps come and have all the holes the same distance from the top of the flask. This clamp can be sprung on without using a wedge and if they are left on until the mould is poured there is no chance of the drag settling.

Cranes

The crane carriage should run free and not cramp on the runway. Cranes moved by hand chains are too slow for ordinary stripping plate work.

The ideal is a crane that will run easily by the moulder pushing on the load and that will not bind or cramp in the least, even when the load is at one end of the carriage. Such carriages may cost more but are nevertheless more economical.

Many stripping plate jobs have been made slower by taking a job that can be handled by hand and putting two pieces in flask and making it a crane job. More pieces can be made where the job can be handled by hand than can be made by doubling up, if the job has to be handled by a crane.

Combination Machines

The principle of drawing the pattern through a stripping plate has been combined with other types of moulding machines, and we find the stripping plate used on power squeezers, split pattern, roll-over machines and jarring machines. In every instance the stripping plate gives better quality and more economical production.

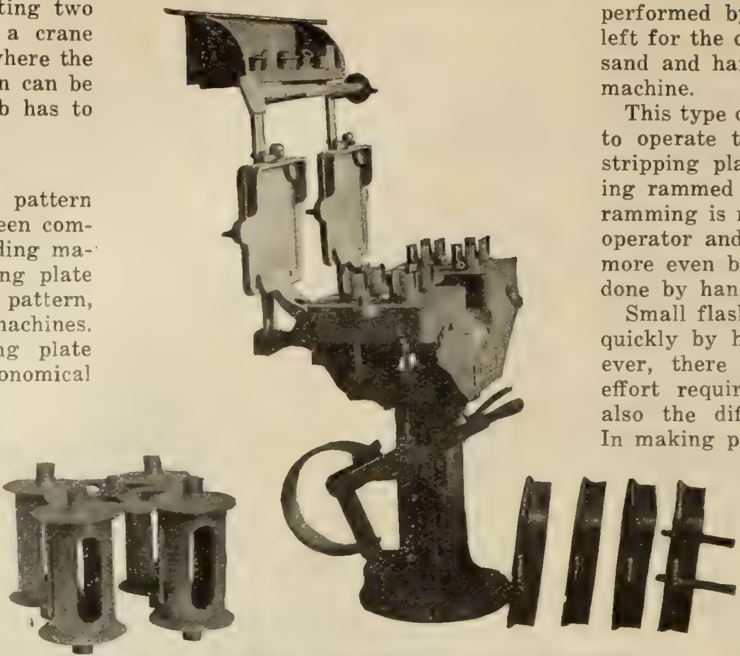


FIG. 11—A FOUR-PART JOB FITTED TO ONE MACHINE.

The Power Squeezer With Stripping Plate

A stripping plate is of benefit on a power squeezer only when castings of the greatest exactness are wanted, or where a quite deep straight draw is necessary. For ordinary work on a power squeezer all that is necessary is to draw the plate and pattern together or to lift the mould from the plate and pattern. In some cases stools are a great help but it is seldom necessary to go to the expense of making stripping plates for work on power squeezers.

The Jar-Stripping Plate Machine

The combination of the jarring principle to ram the sand and the stripping plate to draw the pattern makes a combination embodying two of the best principles so far adapted to mechanical moulding.

The jar-ram stripping plate machine consists of a jarring machine upon the table of which is mounted the pattern. Around the pattern is the stripping plate. When the pattern is drawn four posts are forced up engaging the stripping plate at the corners, thus raising the mould and plate and drawing the pattern. This combination machine has proven to be very fast and requires little physical effort on the part of the operator. Patterns that have long continuous runs are well adapted to this class of machine, particularly so if the mould is deep or quite large in area. The jarring machine rams a large deep mould nearly as quickly as a small mould so the saving in time and physical effort is much greater on the larger size moulds.

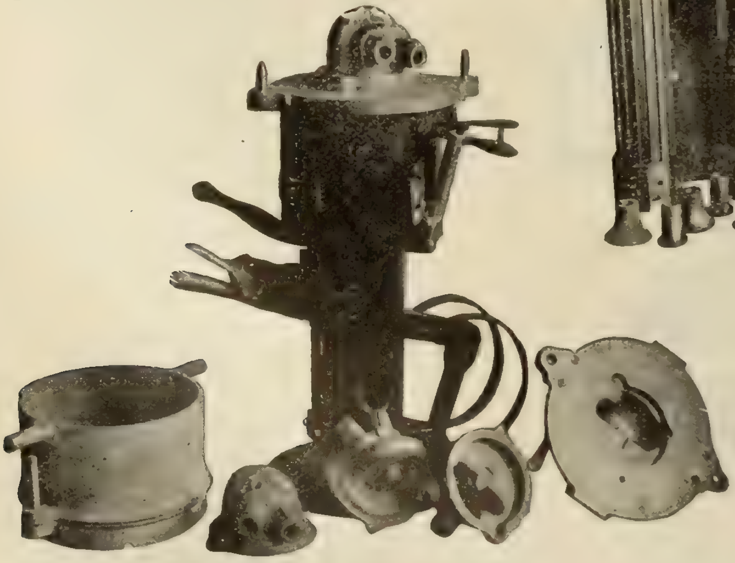


FIG. 12—GEAR HOUSING.

It has been found advantageous to change many plain stripping plate jobs to jar ramming stripping plate machines because the physical effort on the jar-ramming stripping plate machine is so much less. All the hard work is performed by the machine. Nothing is left for the operator except handling the sand and handling the moulds from the machine.

This type of machine requires less skill to operate than is required on a plain stripping plate machine. The sand, being rammed by the machine, no skill in ramming is necessary on the part of the operator and the sand is rammed much more even by this machine than can be done by hand, even by a skilled man.

Small flasks can be rammed nearly as quickly by hand as by machine. However, there still remains the physical effort required from the operator. and also the difference in skill necessary. In making patterns and stripping plates for this type of machine, always keep in mind that there can be no give or spring on the part of the patterns, plate or stools when the mould is being rammed. Keep in mind also that the force of the blow is considerable. The plate must be very substantially built, for if any spring does occur a "false parting" is created in the sand.

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THE Bessemer process for the making of industry of the United States, according to Mr. J. G. Butler in an address before the American Iron and Steel Institute. The idea of removing carbon and silicon from blast-furnace iron in this way was undoubtedly first conceived by an American, although he failed to develop the machinery for its use, and, as a consequence, reaped very little benefit from it. When William Kelly, who first decarbonized iron by means of an air blast in a furnace he had erected for that purpose at Eddyville, Kentucky, about 1850, came to file his claim for a patent in 1856 he found that Henry Bessemer had filed similar claims, and had been granted patents a few days previously. Kelly had worked for years on his scheme, which was identical in principle, but he had not yet made it a commercial success, and did not attempt to make steel in that manner.

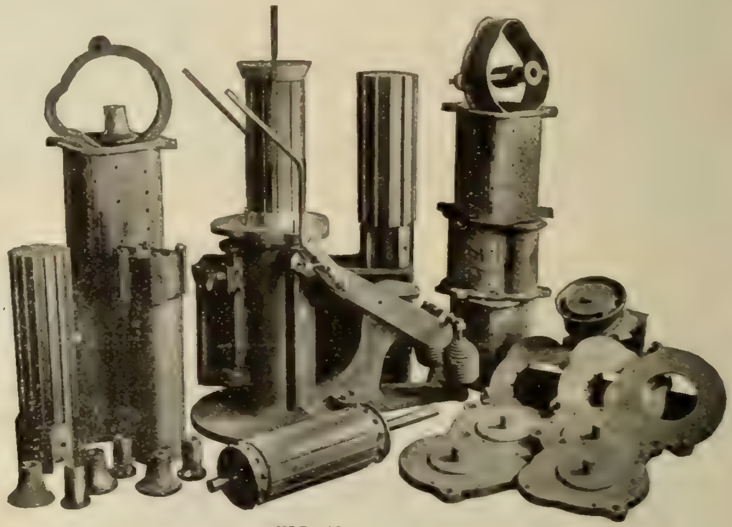

FIG. 13.

Fundamentals of Apprenticeship: National Interest Grows-I

Special Correspondence*

Industrial education is to-day the principal educational theme in this country. Employers, business managers, superintendents, thoughtful craftsmen, educators, economists, social workers, men and women in a hundred walks of life, have focussed their attention with growing earnestness upon the problem. Discussions, proposals and theoretical and practical experiments are gradually leavening the great mass of our industrial life.

THROUGH all the problems of industrial education runs a common conviction that something should be done—must be done—to educate the coming workers in a specific and direct way for the work they are to do. It is agreed by all that the time has arrived for the development of a genuine industrial intelligence in the manhood and womanhood of America, that industrial training is a paramount economic demand of our time.

This is clearly evidenced in the reports of Federal and state commissioners and boards of education; in national, State, and municipal legislation; in industrial training conferences; in the establishment of shop and corporation trade schools; in the growing number of public, and semi-public industrial schools; in the establishment of apprenticeship and industrial education committees by trade associations; by frequent articles in the public press and trade press, and in many other ways.

Raise the standard of skill in the workman. Improve the tone of industrial morality. Give the greatest number of individuals the opportunity to "live a full and ample life." These are some of the urgent demands of the time.

Neglect of Old-Time Apprenticeship

Up to within a few years apprenticeship, that is, a type of the old-world guild apprenticeship with its indenture covering a specified time, was little practiced, and the propagandism for industrial education largely ignored it. The beginning of its decline dated from the industrial revolution which took place during the latter part of the eighteenth century, resulting from the introduction of labor-saving machinery and the subdivision of labor.

Before our modern factory system came into vogue most workmen were artisans, masters of their craft; they knew how to perform and could perform the successive stages in the production of a given article. The old labor guilds fostered the apprenticeship system, and it was difficult for anyone to become a member of a guild who had not passed through all stages of development. In fact the laws and customs of Western Europe especially required that any person desiring to exercise certain branches of skilled labor must serve an apprenticeship. The invention of labor-saving machinery and the introduction of the modern factory system wrought a great change in craftsmanship, and the laws and trade customs formerly governing the apprentice became largely inoperative and obsolete.

The new industrial system developed the specialist,—he who could do but one thing and must perform this one operation day after day and year after year. It separated by a strong line of demarcation, the skilled worker from the unskilled, and so re-arranged the processes of manufacture that the various stages of production became distinct vocations, the workers in a given department of manufacture being quite ignorant of the work performed in other departments. In consequence of this factory system, and the division and sub-division of processes, the great body of workers of necessity became unskilled machine tenders. To overcome this lack of industrial mastery in the great mass of industrial workers, modern employers resorted to many devices, most of which have centered around the employment of skilled supervisors to plan and direct the work and movements of groups of employees. But all of these devices simply emphasize the fact that machinery without trained intelligence to guide it cannot be fully productive, nor the quality of its product raised to the highest standard.

Trained Help Necessary

This condition of affairs has not been overlooked by intelligent employers, nor have the serious aspects of a nation containing large bodies of untrained men and women been lost sight of. For some years the growing seriousness of this situation has been receiving the careful thought and study of progressive employers and far-seeing educators, and out of the many hundreds of ideas, plans, and systems which have been discussed and tried out, in whole or in part, certain basic things are making themselves manifest.

It is agreed that no matter how complex the machine, nor how automatic it may be, the worker is the essential factor.

A leading manufacturer expressed the situation in a nutshell, recently, when he said that manufacturers are coming to the conclusion that "the man at the machine is the most important asset, who spells success or failure for any business."

Employers also are now realizing that economical production consists of much more than the mere repetition of machine operations—that it requires a measure of skilled guidance plus the machine operations.

This conclusion has caused a search for a remedy, and out of all the discussions and studies upon this subject there has gradually grown up a demand for a revival of apprenticeship in practically all industries.

As the late Carroll D. Wright well said in his bulletin, "The Apprenticeship System," prepared for the United States Bureau of Education, "It is unwarrantable to argue that the apprenticeship system answers the whole demand for industrial education—but it may do so to a large degree. It is also needless to argue that the industrial schools furnish everything in the way of vocational equipment that can be gained by a thorough apprenticeship system. What is needed is . . . some co-ordination that shall secure all that can be gained from the apprenticeship system and much that can be gained from modern schools for trade and industrial education generally."

The above is the basis of the work attempted by this conference board, and because of the great interest employers are now taking in this subject and the insistent demand that has grown up in all industries for data and information that can be used in applying the apprenticeship principle to industry, the following is offered as a result of the deliberations of this board.

Personal Interest of Employer

No apprenticeship system nor any scheme of industrial training can be successful without the active interest of the employer. As stated in Bulletin No. 1 of this series, "The employer is the key to the situation." And note that it says "active interest," because the problem of creating an industrial intelligence in the workers who shall man the employers' shops is essentially an employer's problem and cannot be wholly left to pedagogic guidance. There must be a point of live contact between employer and apprentice.

What is an apprentice? The dictionaries give the answer very clearly. Webster says, "One who is bound by indentures to serve a mechanic, or other person, for a certain time, with a view to learning his art, mystery, or occupation, in which his master is bound to instruct him."

Worcester says: "A person bound by indenture for a certain time, to perform services for a master, and receiving in return instruction in his trade or occupation."

The Century Dictionary says: "One who is bound by indenture to serve some particular individual or company for a specified time, in order to learn some art, trade, profession, manufacture, etc., in which his master or masters become bound to instruct him."

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And the Standard Dictionary says: "A person, usually a minor, who serves another in order to learn a trade, art, or profession, especially when bound by indentures for a term of years."

In view of the foregoing it is incumbent upon the employer to exercise a personal interest in his apprentices, and this duty no employer can escape.

Many employers flatter themselves that they are too busy to assume any responsibility for apprentice training, and defer their attention to suit their convenience. On the other hand, employees seek to restrict the number of apprentices in order that they may control the situation. Also many employers have practically no apprentices, depending upon "the market" for their labor supply. They seek the men whom some one else has trained. This method of obtaining a competent worker is akin to stealing him from another employer who, in turn, will do likewise.

Some Employers' Attitudes

Years ago employers heeded their responsibilities when each journeyman master initiated an apprentice into the trade, but as specialization became more pronounced and individual responsibility became merged into corporate management, apprenticeship training received very slight attention upon the part of employers or corporation officials.

If one will but study the history of juvenile labor he will find that old-time laws laid emphasis on the obligation of the master to the young person employed. It was a two-fold responsibility; the master was answerable for the health and moral development of the lad while in his employment, and for his service to the State and career as an adult since his service and his career depended on his physical, moral, and technical training as a boy.

The interest of the employer in his apprentices will foster and develop a spirit of loyalty and integrity possible in no other way. It will assure the young worker of a "square deal" and prevent favoritism or other unhappy circumstances standing in the way of his advancement. It will do much to dissipate the feeling that the only interest an employer has in his workers is the money gained from their labor. It will develop a wholesome spirit of productive rivalry and build up a type of efficiency which cannot be obtained otherwise.

Of course, it is not to be expected that every employer can personally interview all applicants for apprentice situations in his works, nor that he can personally instruct his apprentices, but he can keep close to the situation by personal supervision of his apprentice department.

Boys are impressionable, and if "the boss" evinces a frequent personal interest in their progress and well-being, they will repay it many times in a quickened interest in their work, in loyalty, in steadfastness, and even in affection.

The Greek philosopher, Epictetus, in his discourse upon citizenship, pointed the way for modern employers when he said, "You will do the greatest good to the State if you shall raise not the roofs of the houses, but the souls of the citizens. For it is better that great souls should dwell in small houses than for mean slaves to lurk in great houses."

Apprentice Training Under Competent Supervision

Apprenticeship instruction as applied to modern conditions seeks to train for higher efficiency, not simply to train raw recruits to perform the operations now being done by the average workman. To obtain this higher efficiency apprentice instructors must be specially selected for—

(a) Knowledge of the trade, including its historical, theoretical, and practical aspects;
(b) Ability to teach.
(c) Interest in teaching by constant study to add to their knowledge.
(d) Moral character.

Inefficient workmen, who have to deal with inanimate materials, are never retained in a shop, Therefore, how much more important it is that those selected to deal with a material vastly more precious than wood, metal, leather, or stone, namely, the human material, be chosen for their proven capabilities!

It is in the selection of competent teachers or supervisors, that the employers' interest, as previously discussed, should be first manifested. While the small shop employer cannot afford nor be expected to employ a high-salaried apprentice instructor, the large shop employers should seek out the best available teaching talent that will combine thorough knowledge of the industry with pedagagical qualities. It is rare that these combined qualifications can be found in any one individual, consequently, the large shop employer may find it necessary to employ several teachers. Whenever a workman is selected to supervise the apprentice training he should be chosen for his special skill, and, before undertaking to instruct, should receive a course of instruction himself, so that he may know how to correctly classify the theories and practices of his trade in such a way that the young mind may absorb the successive steps of manufacture.

Cross Ideals

Without competent supervision, the apprentice is very apt to be exploited to the disadvantage of himself and his employer. For instance, if the boy is left to the care of the average shop foreman it will quickly become evident that the ideals of foreman and apprentice are at cross purposes. The apprentice is intent upon learning the trade. The foreman understands his job to be that of keeping down the cost of producing. Consequently he will look upon the boy either as an unwise burden on his department, or, accepting him as a necessary evil, will compel him to perform certain duties that have no relation to trade instruction. He may even keep the boy constantly employed at some given operation because of a special acquired proficiency instead of advancing him through the various stages.

A similar condition generally results when the boy is turned over to a journeyman worker. In this case the most the boy can hope to acquire is the limited knowledge possessed by the journeyman, and the latter is apt to do one of two things: either use the boy as a helper without regard to progressive instruction, or deliberately prevent the acquirement of knowledge because of ignorance or prejudice.

Employers will find that it will be quite necessary to educate their foremen to give apprenticeship its rightful place in the plant, as well as to impress upon journeymen workers that the boys under training are to receive special consideration.

Large employers of labor can prevent exploitation of the boy by the employment of supervisors, who have special competency for this work, and by the establishment of a rule, practised successfully in a number of shops, namely that during the period of apprenticeship the apprentices are under the jurisdiction of the supervisor rather than the foreman, and the shop work selected for the apprentice must be of an educative nature, an industrial curriculum over which the supervisor has full control.

In small shops the employer himself can and should supervise the work and study of his apprentices, directing foremen or journeymen as to what they shall teach and how the instruction is to be given.

Most larger concerns which have modern apprenticeship systems, provide study to supplement the work in the shop. It is recognized that the object of an apprenticeship system is to teach the boy a trade, and that the trade cannot be properly learned unless the boy knows the mathematics, mechanics, theories, and business methods which accompany the trade. This instruction is given generally in a schoolroom connected with the factory or shop.

Practical Trade Training and Applied Technical Instruction

The great mass of industrial workers have only a certain amount of manipulative skill; the work which they perform is often meaningless to them. Modern apprentice instruction, by a proper corelation of practical trade training and applied technical instruction, seeks to impart a thorough all-round knowledge, not only of the actual manufacturing processes but the reasons that lie behind. Technical education, as combined with apprentice instruction, is simply the education necessary to enable a boy to become an intelligent workman—one who can see the principles underlying the methods of work—one who can give a reason for doing a thing in a certain way and who does not blindly follow a certain rule. Technical education is the mental training of the apprentice, so that his understanding may be fully awakened.

That there is great need of awakening this intelligence is easily seen, when one considers that most of the boys and girls who seek industrial employment are deficient in even the common fundamentals which are popularly called the "three R's"—reading, 'riting, and 'rithmetic, and this condition is not confined by any means to boys and girls, but extends likewise to older students.

Be that as it may, the employer is confronted with the task of securing his supply of beginners and junior workers from an untrained host, and if the findings in the published report of the Commission on Vocational Education appointed by the Sixty-third Congress are correct, or even approximately correct, that 85 per cent of all the children that enter the public schools of the country leave the schools before they reach the age of 16; that not over 8 per cent. of those who enter the high school ever get through and take the diploma; that not over 3 per cent. of those who are graduated from the high schools ever enter the college or university, and that hardly 1 per cent. of the 14,250,000 persons engaged in manufacturing and mechanical pursuits have had, or at the present time have any chance to secure adequate training in their chosen industry, is not the necessity of supplementing practical trade training with applied technical instruction imperative.

This conference board believes it is essential to the success of apprenticeship instruction to co-ordinate a careful system of class-room studies with shop training, arranging these studies on a definite schedule of time.

Class-Room Work on Employer's Time

No employer should begrudge the time spent by his apprentices in class-room work, whether this time be spent in his own class-room or in the class-room of continuation schools.

In some states, and in places abroad, attendance at continuation schools is compulsory on certain classes of minors, and the employer is obliged to grant the necessary time for this study. But whether compulsory or not, employers should recognize the fact that class-room work is an important phase of apprentice instruction, and not only insist upon it, but also continue regular pay during specified class-room hours.

It is essential in a proper system of apprentice training that adequate instruction be given to the apprentice along every line, cultural, technical, and practical, and as the cultural and technical are only parts of the required instruction, and as all the instruction given is for the purpose of developing the apprentice into an economical producer, —a profit maker for the employer as well as a good wage earner—the paid-for time spent in class-room work, which awakens and develops the intelligence, and thereby creates a much higher degree of operative or manipulative skill, eventually becomes a profitable investment.

No Financial Obligation of Apprentice

It has been said by an English writer upon "English Apprenticeship", that in all probability the Elizabethan system of apprenticeship was the most efficient and the cheapest system of training that was ever available for the masses of the English nation. The nation neither paid for class-rooms nor for teachers and inspectors, since the guildsmen served as inspectors, and master and boy entered into an agreement for their mutual advantage, which required no payment on either side. For although the apprentice received not only instruction, but board and lodging, there seems to have been no idea, when first the system of apprenticeship was developed, that the training and education, which it provided, should be paid for in money. It was upon the services of the apprentice, especially at the end of his term, that the master had to count for a return of his trouble and the lad's maintenance.

This was in early times; later on a change set in, and one of the complaints made against apprenticeship by eighteenth century writers was the heaviness of premiums charged by the masters upon taking apprentices. The payment of premiums, even became a governmental source of revenue, as a stamp tax of sixpence in the pound was imposed upon sums of fifty pounds or under, and one shilling upon sums of over fifty pounds, affecting the engagement of clerks, apprentices, or servants, placed with any master or mistress to learn a trade. The amount agreed upon had to be named in the indenture, and, as early apprentice history shows, if the master failed in his obligation to instruct, the court, upon presentation of satisfactory evidence, required the restoration of all or a part of the premium.

This old-world custom of the payment of a premium by the apprentice to the master or employer was transplanted to this country, and, although not practiced to the extent that it was abroad, was, nevertheless, a recognized custom for many years—in fact is, even to-day, practiced by not a few employers, who exact a premium from the apprentice under one of three general plans, namely,

(a) By cash bonus.

(b) By deferred wage payment, forfeited for reason.

(c) By tuition fee.

Regardless of the reasons which might properly have been set up for such charges in the past, no reason, aside from long-time custom, can be given for such charges to-day. A cash bonus, or lump sum payment, for the privilege of learning a trade, or the assessment of a tuition fee, has no place in modern apprenticeship system. Private trade schools, conducted for profit, or endowed industrial schools, may properly charge a fee for their instruction.

In reference to a deferred wage payment, this also should not be countenanced by employers. It has been the custom, and it still prevails in many places, of holding back a certain portion of the apprentice's rightful wage until he has successfully completed his apprenticeship and then presenting it to him in the form of a bonus. While this conference board recommends the payment of a bonus under proper conditions, it does not believe it to be permissible in these modern times that any part of an apprentice's rightful wage should be held back as a coverage for lost or damaged tools, or other possible wastage; nor as a possible penalty for slackness or slothfulness; nor as a means of preventing the apprentice leaving before the expiration of his full time; nor as an installment deposit to assure faithful performance and good conduct; nor for any other cause.

If the apprentice fails to keep his part of the contract, either through carelessness, inherent ignorance, or wilfulness, the employer has but to dismiss him, thereby applying a condition of the indenture.

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BIG IRON DEPOSITS IN QUEENSLAND

Some of the reports prepared by Dr. Jack for the Queensland Parliament indicate that that State possesses enormous deposits of iron. One of the chief deposits is at Iron Island, described by Dr. Jack as rich hematite ore, and he added that unlimited quantities of the present limestone were available in the vicinity of Mount Lucy, about 10 miles from Cairms, on the Chillagoo line. Dr. Jack reported the location of an enormous outcrop of exceedingly pure magnetite, in which crystals containins as much as a cubic foot can be obtained. He described the iron mountain at Kangaroo Hills, near Townsville, as an enormous bed of magnetic ore, of vast proportions. A special report was prepared of Mount Leviathan, in the Cloncurry district, as a mass, say, 200 feet, and one-quarter mile in diameter at its base, of the purest possible iron ore, the greater part of which is specular iron ore. In the same report he described Mount Pisa as a hill of iron ore, very like Mount Leviathan, but not rising to such an enormous mass. Dr. Jack reported upon a large lode of pure magnetic ore on the Wild River, 60 miles from Marooba, also upon deposits at Gladstone, at Pittsworth (on the Downs) in which the assay was 62 per cent. of iron; at Biggenden, Degilbo and Mount Perry, and stated that other large deposits were to be found on the Don River in the Mount Morgan district.

The Economical Use of Grinding Wheels in the Foundry*

By W. T. Montague**

Next to a proper understanding of the grinding wheel as a cutting tool, the author points out the necessity of giving careful consideration to the castings to be ground, specially referring to their size and shape, the physical properties of the metal and the amount of grinding to be done. Weight and rigidity of machines, solidity of foundations, and suitability of bearings and lubricating arrangements are points of particular interest.

THE modern grinding wheel plays an extremely important part in the metal-working industries. Its great usefulness begins in the foundry just as soon as the newly-poured castings have become sufficiently cool to be removed to the cleaning floor. It is used in the alloy steel industry to remove seams, blisters and flaws from billets, prior to rolling them into commercial shapes. Large numbers are used later on to grind the various metal parts that are fashioned into machine tools, automobiles, aeroplanes, locomotives, war munitions and the multitude of steel tools that are also employed in cutting metals.

Realizing that the grinding wheel is practically indispensable to the foundryman, it is fair to assume that he is vitally interested in those factors that contribute to the economical use of this cutting tool. Although widespread publicity has been resorted to by some of the grinding wheel manufacturers, in order to demonstrate the methods of using and caring for grinding wheels to obtain maximum service at minimum cost, yet tsere are evidences that there is much to be learned in this direction.

To develop the modern grinding wheel into a tool of usefulness and dependability, has been the abrasive manufacturer's problem, but the problem is not solved when the wheel is produced. The grinding wheel maker must go further than this. He must educate the user so that he can take advantage of all the qualities that science and skill have put into the wheel.

Analysis of the Grinding Wheel Problem

The development of this paper will rest upon the following analysis of factors that will contribute to the economical use of grinding wheels in the foundry, if they are understood and taken into consideration:

1.—A thorough understanding of the grinding wheel as a cutting tool is the first essential.

2.—The castings to be ground must be carefully considered with special reference to their size and shape, the physical properties of the metal, and the amount of grinding to be done.

3.—The condition of the grinding machines must be satisfactory. This refers to weight and rigidity, solid foundations, adequate bearings and proper lubrication.

4.—The speed of the grinding wheel is of the utmost importance and must be held within certain limits if proper cutting action and economy in wheel consumption are to be obtained.

5.—The personal factor must be taken into consideration and allowances made for it.

6.—Adequate records of wheel consumption should be kept and if conditions warrant, industry and economy on the part of the workmen should be properly rewarded.

7.—The use of the grinding wheel should be made safe by proper protection devices.

The first portion of this paper will deal with the proven theories of cutting action. They will be gone into quite fully, as it is believed the information will be available to foundrymen who may be using grinding wheels.

It is a well-known fact that the amount of work one gets out of a machine, engine or tool, is often directly proportional to one's knowledge and understanding of that machine, engine or tool, granting, of course, that the tool is not defective or unsuited to the operation in the first place. This is particularly true of the grinding wheel, which is an aggregation of minute cutting tools bonded together so they can withstand the high rotative speed necessary to rapidly remove large quantities of metal.

The composition of the vitrified grinding wheel, which type is almost always used for snagging castings, is as simple as its manufacture is complex. It is made of abrasive grain, clay bond and water. Subsequent burning in a kiln and heat treatment vitrifies the bond and produces that quality termed "hardness."

The selection of abrasive material is almost entirely dependent upon the nature of the metal to be ground. There have been developed for cutting the metals used in castings to-day, two principal kinds of artificial abrasive—the aluminous group and the carbide of silicon group. Included in the former are alundum, aloxite, boro-carbone, adamite, and the like, and in the latter group crystolon, carborundum, carbolite, etc. Without going into the reasons, therefore, we will simply state that experience has shown that for materials of high tensile strength, the aluminous abrasives prove the most efficient. This means that the various kinds of steel, wrought iron and annealed malleable iron, automatically call for an abrasive such as alundum. On the other hand, crystolon is chosen for cast iron, including gray and chilled iron, unannealed malleable iron, brass, bronze, aluminum and copper, which are materials of comparatively low tensile strength. This distinction is clear cut and quite easy to remember.

The Question of Grain Size

The question of what size of grain to use is not difficult to settle. The size of the wheel, amount of material to be removed, and the nature of the metal usually determine this very readily. Finish is seldom a consideration and so very coarse grits are used.

How hard to bond a grinding wheel is a point not so readily determined. The influencing factors are many, including:

1—Physical properties of the metal to be ground.
2—Shape and condition of the surface to be presented to the face of the grinding wheel.
3—Speed of the grinding wheel.
4—Condition of the grinding machine as to rigidity and steadiness of spindle.
5—Method of applying the work, that is, whether mechanically or entirely by hand.

In trying to serve our customers and meet their requirements, we are continually reminded that the question of what constitutes a "grade" or the degree of hardness of a grinding wheel is not fully understood. Grade is the word used to designate relative hardness of any given grinding wheel. By hardness, we do not in this instance refer to the hardness of the abrasive, which is fixed throughout any one wheel. We refer to the strength of the bond in retaining its grip on the cutting grains of the wheel. If the bond is of insufficient strength to hold the cutting particles in the face of the wheel until they have become dulled and worn from the cutting process, then we call the wheel too soft. On the contrary, an excessively "hard" wheel is one where the bond retains the grit long after it has become dulled, and is therefore practically useless. The word "hardness" might almost be called a misnomer and perhaps the somewhat more clumsy phrase, "resistance to disintegration," ought to be substituted.

This resistance to disintegration, or grade, is actually determined by measuring another separate property of the wheel, namely, the resistance of the bond to the penetration of a hardened steel tool. However, it is known that each of these properties is a function of the other and to measure the force of resistance to disintegration in grinding wheels has been impossible on a commercial scale up to this time.

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*Read before the annual meeting of the American Foundrymen's Association, Boston, September, 1917.

**With the Norton Co., Worcester, Mass.

The belief is quite common that a grade is an exact value. A grade is not an exact or definite point in the scale of hardness. It is a range between limits and all wheels which test within this range carry the same grade letter.

One way to measure the strength of the bond is to revolve a grinding wheel at increasing speeds until it bursts. Knowing the bursting speed, the centrifugal force necessary to cause the bond to break down can be readily calculated.

In order to obtain this data a lot of wheels were speeded up to a point where the fiber stress, due to centrifugal force, exceeded the strength of the bond and breakage occurred. All of these wheels were of the same size, with the same grit, but of different degrees of hardness. The grade J broke when the stress was 1650 pounds per square inch, the grade K at 1750 pounds per square inch, and so on. Therefore, one might infer that all grade J wheels would burst when this same stress was reached.

Not an Exact Value

Now let us see what really happens when several wheels of supposedly the same grade are tested. We find that those that have been determined to be of grade J hardness will burst at stresses ranging from 1600 to 1700 pounds per square inch, grade M at from 1880 to 1790 pounds per square inch and so on. In other words, a grade represents a range of values between definite limits. An understanding of this point is most essential to the users of grinding wheels and will explain many seeming variations in grinding wheel action and life.

Assume a certain snagging operation is being performed, whereby all the factors combine to bring a pressure against the grain on the face of the wheel which causes a stress of a particular nature to be set up. Bear in mind that this is a tangential or peripheral stress, so to speak, not a stress due to centrifugal force. The wheel whose bond has a strength of sufficient magnitude will have a longer life than one not so constituted. This last wheel will not be bonded strong enough to withstand the grinding forces and will wear away quite rapidly, in fact, much more rapidly than the difference in strength or hardness would seem to warrant. This point has been developed in detail because an understanding of it will eliminate many questions arising between the wheel manufacturer and the wheel consumer. It is needless to say that there is a close limit to the allowable variation and the manufacturer who best keeps within these limits, deserves the greatest confidence of the consumer.

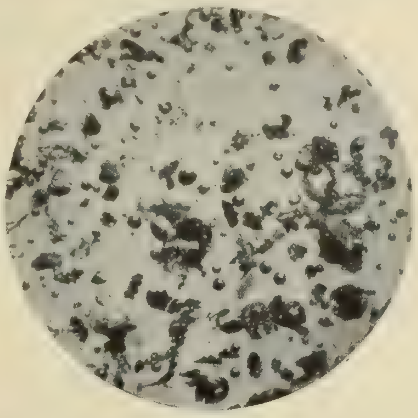


FIG. 1. CHIPS FROM WORK GROUND WITH AN UNSUITABLE WHEEL UNDER IMPROPER CONDITIONS.

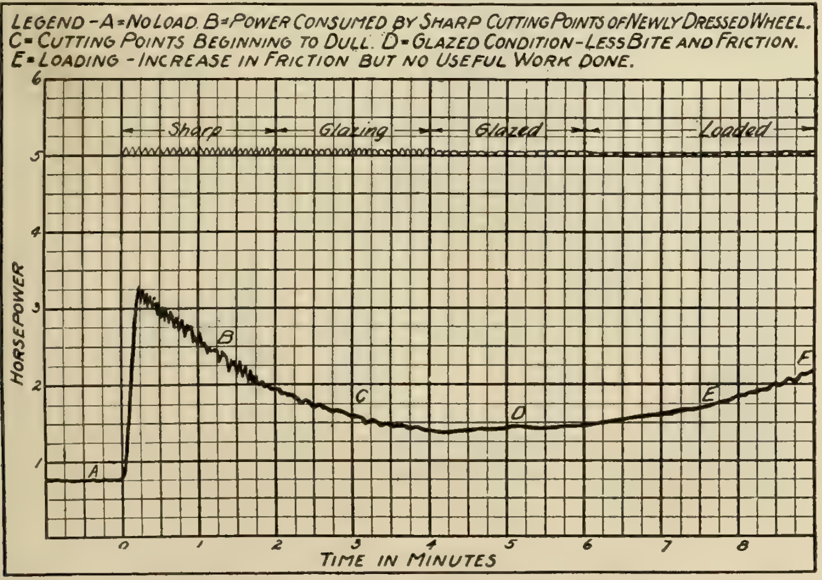


FIG. 3—POWER CONSUMPTION UNDER DIFFERENT WHEEL CONDITIONS.

The old idea of grinding considered it as a wearing down of the metal by rubbing or friction. This is now our understanding of the lapping process and modern grinding has progressed far beyond this point. However, if a wheel is bonded too hard for the work at hand, or if the wheel is too fine or composed of an inferior abrasive, the metal is actually rubbed or burned off, as shown in Fig. 1.

The modern grinding wheel of correct specifications for the work produces chips like those shown in Fig. 2. Its action is similar to that of a steel milling cutter. On the face of the wheel are millions of cutting teeth at work every minute, and, although these teeth are not as large nor as strong as the teeth of a steel cutter, and cannot cut as deep, they are capable of working at a much greater speed.

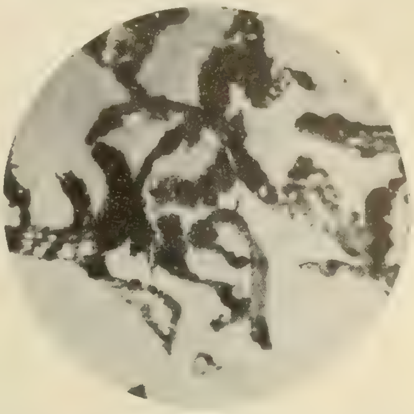


FIG. 2. A MODERN GRINDING WHEEL OF CORRECT SPECIFICATION PRODUCES REAL CHIPS LIKE A MACHINE CUTTER.

In order for a wheel to cut fast and free, it is necessary for it to wear—that is, for the bond to release those grains that have become dulled and useless. From this it is seen that the grain, which has to the greatest degree the physical property of hardness (we refer to mineralogical hardness), combined with sharpness, is the most efficient and will do the greatest amount of useful work before dulling. It is these very qualities that make alundum superior to the softer and more impure abrasive, emery, which dulls very rapidly under cutting pressures.

A set of experiments recently was carried out, showing how the condition of the face of a grinding wheel affects its cutting action, its ability to remove metal and the power consumed in doing this. The results are shown in Fig. 3, which represents the curve traced by the stylus of a Westinghouse graphic wattmeter connected to a motor-driven grinding machine. Section A of the curve shows the no-load power. Then a bar of steel was applied to the wheel under a given pressure and this pressure was held constant throughout the tests. What happened? First, the power consumption climbed abruptly as the sharp cutting grain bit deeply into the metal. After two minutes of this rapid cutting, we reached the glazing point and the line C resulted. At D we were working with nearly all worn down flat. The power consumption was low because there was pratically no useful work being done. The smooth grain simply rubbed and slipped over the bar. At E. the steel began to heat up and get sticky, so that particles began to load and smear into the pores of the wheel face. These respective conditions of the grains are illustrated diagramatically from left to right above the curve. The power now climbed again, but still pratically no useful work was being done. At F, or even before this point was reached, the wheel should have been dressed or resharpened. This aptly illustrates the folly of using a wheel that is too hard or dense to cut freely without resorting to continual dressing.

Action of an Ideal Wheel

The action of the ideal wheel is pictured in Fig. 4. This shows that the glazing period is no sooner entered upon, than the bond suddenly gives way and releases the dulled teeth. New and sharp grains take their place and the cutting is resumed at very nearly the initial rate. A wheel of the correct grain and grade for the operation at hand can oftentimes be dressed by the additional application of pressure on the part of the operator, or by presenting the very sharpest fins on a casting to the wheel face under increased pressure. This means that useful work is being performed while sharpening the wheel, with practically no lost time or wear of dresser cutters. It is this condition that all should aim for in selecting snagging wheels and the workmen should be educated to this kind of grinding.

Some think that in order to make a wheel cut, you must force it exceedingly hard. This is not true, if the wheel is not excessively hard or fine for the work. A wheel of the correct grain and grade will cut faster if you do not force it too hard. If these points are clearly understood, it will enable you to direct the grinding end of your business intelligently. Failure to grasp the essentials will prove disastrous to economy.

The next factor of importance to economy in the use of the grinding wheel in the foundry is a knowledge of the effect of the physical properties of the metal to be ground. To say that a wheel is desired for malleable iron may not be enough. This expression sometimes covers the annealed malleable and sometimes the white iron before it has been annealed. If the iron is of the annealed variety, then alundum or an aluminous abrasive should be employed, but if the iron has not been annealed, then by all means use crystolon or some carbide of silicon abrasive. Furthermore, the white iron castings usually require wheels of much greater hardness than the annealed castings and this is readily understood when the difference in hardness, density and structure of these metals is known.

It is a common saying that the harder the metal, the softer should be the grinding wheel. Strictly speaking, this applies only to precision grinding, certainly not to the snagging of castings. Let us consider manganese steel, which, as everyone knows, can be machined economically only with abrasives. This material offers a high resistance to penetration and hence slightly finer grits are usually employed for snagging castings made of manganese steel than would be used for ordinary carbon steel. Coarser grits would require more manual effort than could be expected from the ordinary workman.

Soft, stringy materials generally call for comparatively coarse grits and medium hard grades. Dense, brittle materials require slightly finer grains and harder grades, sometimes one or both.

The following table may illustrate this to a little better advantage:

Metal	Grade of Wheel
Manganese Steel Castings	16-Q or R Alundum Vitrified
Carbon Steel Castings	10-U Alundum Vitrified
Brass Castings	24-Q Crystolon Vitrified
Chilled Iron Castings	16, 20 or 24-S, T or U Crystolon Vitrified

It is no doubt well understood that the harder the fins and the sharper the contact, the harder must be the grinding wheel. This is necessarry to counteract the dressing and tearing action of the projecting metal.

Grinding Steel Castings

In grinding steel castings, the breaking-off of gates and risers often leaves a very large volume of metal to be ground away. As the arc of contact thus increases there are increased loading tendencies, and sometimes a heavy, black oil is daubed on the metal, to keep the wheel open and thus reduce dressing. After much experimenting, a specially treated or filled wheel has been developed that automatically lubricates the cutting grains and often greatly lengthens the life of the wheel because of reduced dressing. This filling is not thrown out by centrifugal force; it increases the life of the wheel and many times causes faster cutting action because of the lubrication. In instances where the grinding is of a very rough, heavy nature, this special treated wheel shows up to very good advantage and it would not be economical to use anything else.

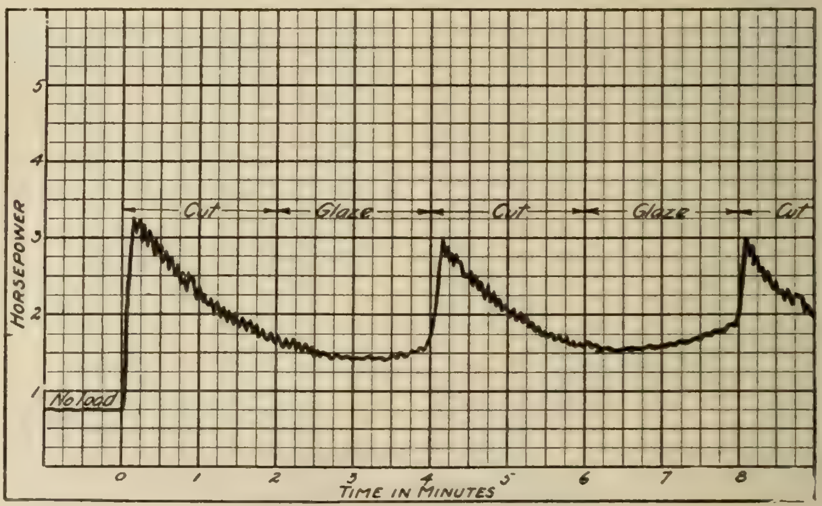


FIG. 4. ACTION OF AN IDEAL WHEEL.

We now come to the third factor which has an important bearing on grinding wheel economy, namely, the condition of the grinding machine. Economy cannot be expected if the machines are light and shaky, or if the foundations are not solid. A grinding wheel that vibrates or jumps from any of these causes is soon pounded to pieces by the percussion set up by the castings on the face of the wheel.

A test conducted by an extensive user of grinding wheels for the purpose of determining whether or not it pays to install concrete foundations under the grinding machines may iterest you. This test was conducted with wheels of the same size and same grain and grade on the very same machines and indentical castings. One set of machines was mounted on concrete or solid foundations and the other on wood or shaky foundation. The results were as follows:

Average life of wheels on wood floor, days	113
Average life of wheels on concrete floor, days	188
Increase in life due to solid foundation, per cent.	65
Average saving a month per wheel on concrete floor	$ 2.00
Average yearly saving per wheel	24.00

Where many wheels are used, this saving is a decidedly large and important consideration. In this case, the concrete foundation paid for itself inside of two months and the saving in wheels will go on indefinitely. As it was, several hundred dollars were saved by this company the first year that concrete foundations were used.

Loose and insecure mooring is also detrimental to the life of the grinding wheel. Don't wait until the machine begins walking around the foundry floor before remedying matters.

Similar figures could be produced to show the saving effected by keeping bearings in good condition. Excessive radial play and end play destroy the wheel rapidly. Many times complaints received to the effect that grinding wheels are not standing up as they formerly did can be traced directly to bearing troubles. The introduction of harder grades, as for example, from grade S to grade U, only partially remedies matters because the speed of cutting is sacrificed and the operator has to put forth greater effort to do the same amount of work.

Grinding Large Castings

In the case of the medium-sized or large steel foundry grinding quite a variety of castings, it is important to have the grinding machines properly arranged and grouped, so the work may be ground with a minimum amount of handling.

Extremely large castings that must be ground in place should be gone over with wheels mounted on small portable electric, pneumatic or flexible shaft grinding machines. In the case of the electric machines, all that is needed is a convenient lamp socket or a wall terminal.

Next should come a battery of swing-frame grinding machines to handle the medium heavy castings such as drawbars, locomotive wheels and other similar heavy castings that cannot readily be handled. These machines should be located where prompt crane service is to be had. Then finally, the smaller castings that could be easily handled should be ground on floor stands conveniently arranged.

The proper grouping of machines, segregation of castings, and prompt crane service will make for general efficiency in the cleaning operation. This should be looked out for by a man of good judgment, who could also tell where to grind and where to chip. Much valuable time is lost in trying to chip off fins that could be ground off in a fraction of the time and with much less effort.

A table showing the horsepower required to drive various sizes of bench and floor stands might prove of some help at this point. The values shown in this table were measured under actual service conditions and may, therefore, be considered reliable guides in the selection of motors. The table follows:

	Machine.	No. of hangers	Friction H.P.	Total H.P.	Net H.P. consumed	Size of motor H.P.	Wheels used in test
¾"	Norton Bench Belt-Driven	12	1.08	1.87	0.81	2	2-10 x ¾ at 5000 S. F. P. M.
1¼"	Ransom Bench Direct-Connected	2	0.75	3.00	2.25	3	2-12 x 1¼ at 5000 S. F. P. M.
1½"	Norton Floor Belt-Driven	5	0.95	3.88	2.93	4	2-16 x 1½ at 5000 S. F. P. M.
2"	Norton Floor Belt-Driven	11	1.30	4.75	3.45	5	2-24 x 2½ at 5000 S. F. P. M.
10"x72"	Norton Cylindrical	2	2.50 to 3.00	10.00	7.50	10	1-18 x 2 at 5000 S. F. P. M.

Much has been said and written about proper operating speeds for grinding wheels, but perhaps some important phases of this subject have not yet been made thoroughly clear. Generally speaking, the correct speed ranges for the grinding wheels used in snagging castings lie between 5000 and 6000 surface feet per minute. This is fairly well established and quite generally accepted by the manufacturers of grinding wheels. This range was determined partly by long years of experience and partly by physical laws and the desire for an adequate factor of safety. The engineer building bridges, steel structures, machines and what not, recognizes the necessity for an adequate factor of safety and makes due allowance for it. Similarly, the engineer in making grinding wheels sees the great necessity for a factor of safety in operating speed. All snagging wheels made by reliable manufacturers are subjected to a speed test the last minute before being packed that generates a centrifugal stress many times in excess of the stress prevailing under the recommended operating speed. In the case of the Norton Co., this tested factor

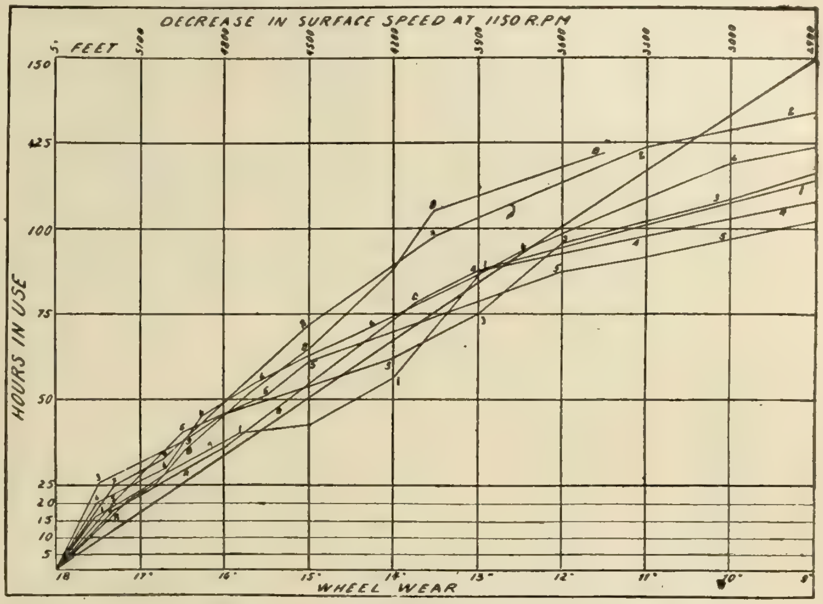


FIG. 5. RELATION OF LIFE OF WHEEL TO SPEED.

of safety runs from 2¼ to 3¼. This, then, is the first limiting factor to wheel speed.

Furthermore, it has been shown there is no appreciable gain from faster speeds, at least not enough gain to offset certain drawbacks. It should be further remembered that the grinding wheel is designed to operate at approximately the recommended speeds and any appreciable deviation calls for adjustments that are not always easy to make or conductive to efficiency.

Keep Surface Speed Constant

It is now common knowledge that it is necessary to keep the speed of the grinding wheel approximately within the recommended range if its productive capabilities are to be maintained. It has been demonstrated that if a wheel's speed is allowed to fall to a very low level, or if it is speeded up beyond a certain point, in both cases reduced cutting ability for the same amount of effort expended is the result. In the case of a sub-normal wheel speed, not only does the productive capacity fall off, but also, there is excessive wheel wear.

To illustrate this point, let us consider the case of an 18-inch wheel, 10 grade U alundum, used for snagging steel castings. At 1175 revolutions per minute its peripheral speed is 5500 surface feet per minute, and it cuts and wears satisfactorily. If the revolutions remain the same, at 11 inches diameter, the surface speed is reduced to 3500 feet. What is the result? Every cutting grain on the face of a revolving grinding wheel has a definite amount of energy stored up in it. It is the expenditure of this energy that enables the grain to do useful work and remove metal. Now the energy available varies as the square of the surface speed. Therefore, at 11 inches diameter, the cutting grains have only 40 per cent. of the energy that they had at 18 inches diameter and they cannot be expected, therefore, to grind as rapidly. Also, because of the decreased energy stored up in each grain of abrasive, it is less capable of withstanding the resistance offered by the steel and hence is more readily torn from its setting. This, then, explains the difficulty that will be encountered in attempting to grind at very low surface speed.

On the other hand, if this same 10 grade U alundum wheel was giving satisfaction at 5500 surface feet per minute, and an attempt were made to speed it up to 7000 surface feet, no greater production would be realized. This is due to the glazing effect resulting from the increased duty imposed on each abrasive grain.

Keeping a fairly constant surface speed by increasing the revolutions as the wheel wears down, is the proper procedure for maximum cutting ability with minimum wear. This relation of life of wheel to speed is perhaps more clearly indicated in Fig. 5, representing actual results of tests conducted in a large foundry. The curves show the rate of decrease in wheel life as the surface speed drops off. The continuous straight line is for a wheel lasting 150 hours, wearing uniformly from 18 inches to 9 inches in diameter. Surface speed at the start was 5400 surface feet per minute, and, the revolutions per minute being maintained constant at 9 inches diameter, the surface speed was reduced to 2700 feet.

At 5400 surface feet per minute and full diameter, all of the wheels tested start off at a 200 or 250-hour pace. However, before the speed has been reduced 300 surface feet, we notice a change in the slope of the curve indicating reduced life. At 4000 surface feet per minute, 13 inches diameter, the falling off is most pronounced and instead of obtaining 150 hours of wheel life, it ranges all the way from 100 to 135 hours. Had these wheels been speeded up at 15 inches diameter and again at 12 inches, the 150 hours life would have been more nearly attained.

What Excessively Hard Wheels Lead to

When a user of grinding wheels wishes to avoid the trouble of maintaining fairly constant surface speed, he invariably tries to keep his wheel life up by using wheels of excessively hard grade. The immediate effect of this is increased power consumption and decreased speed of cutting, neither of which are desired. Fig. 6 shows that regardless of speed, successively harder grades require more and more power to remove the same amount of material.

It is, therefore, quite evident from the foregoing that economy in wheel life comes from maintaining fairly constant surface speed as the diameters of the wheels are reduced. This can be brought about by using variable speed motors, or having machines running at graded speeds, to which the worn wheels are shifted at given sizes.

The next point that requires careful consideration is the personal factor entering into the use of snagging wheels. No two men will get the same life or production from a grinding wheel, even though the work and conditions are identical. If the foundry is large and there is a constant duplication of work so that the piece rate can be used, then it is safe to say that harder wheels must be used than where day rate compensation is in force. However, the ideal condition that permits the wheelmaker to specify a free-cutting wheel, is where there is a premium paid for maximum production with minimum wheel wear.

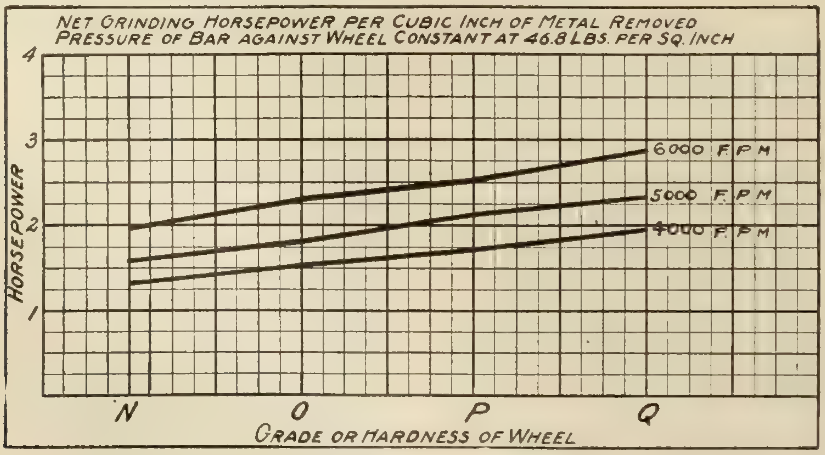


FIG 6. RELATION OF HARDNESS TO POWER CONSUMPTION.

Some men work the corners of the wheel hard, others are abusive in applying the castings, and still others think they must remove a quarter of an inch of abrasive in dressing, where a sixteenth of an inch would be ample. All of these factors have their effect, and must be allowed for. It is, therefore, important that some kind of a record should be kept, showing just how each grinder uses his wheels. Many times the grinding wheel manufacturer is blamed unjustly for apparent variations in wheel life and hardness. In some of these instances the true causes can be attributed to the operation of this personal factor. For instance, if a wheel should happen to be on the soft side of grade S and it should get into the hands of a grinder who was very hard on grinding wheels, a certain life and production would be obtained. Now, in the same lot of wheels, there might be one that varied slightly the other way or toward the hard side of grade S. Suppose that this was used by a man who was more careful in using his wheel. It is evident the wheel would last very much longer under these conditions and hence from a very slight and permissible variation in hardness of wheel we get a result that would indicate a wide variation, if the personal factor is not considered. This is not idle speculation. It is stated from observation of actual cases.

Where there is a constant duplication of work and the piece-rate is used, there is a very simple but serviceable method for computing the relative efficiency of various grinding wheels and operators. The operator's earnings on a given class of work per dollar cost of wheel may be considered, under these circumstances, as a very fair means of determining the efficiency of the particular wheel used. To encourage operators to use their wheels economically, a bonus or premium is sometimes paid for all earnings in excess of a given figure. This works out very satisfactorily and means that the competent grinder is rewarded for his competency. It also invariably means that free-cutting wheels will be used and hence maximum production is obtained.

Records on Snagging Castings

Here are some actual figures obtained from snagging wheels that are interesting:

Life Hours	Weight of Castings Pounds	Average Per Hour Pounds
127	26,543	208
157½	27,043	172

If no records were kept, the wheel with longer life and slightly greater total tonnage would undoubtedly have been picked as the more economical to use. However, the wheel with 127 hours life produced 20½ per cent. more castings a day and the profit on this increased production more than offset the slightly increased abrasive cost.

Another large consumer of snagging wheels keeps a tabular record on printed cards of the following: Date; pieces ground; weight, pounds; hours of grinding; earnings; and wheel loss on diameter. These figures permit the calculation of the abrasive cost per ton of castings ground, and the earnings per ton of castings ground. Manifestly, it is desirable to keep the abrasive cost as low as is consistent with satisfactory earnings per ton. Keeping such records as these makes it easy to pick out the correct grinding wheel, and enables the foundryman to tell just what each of his grinders are doing. He can also tell what the wheel manufacturer is sending him without guesswork or resorting to hearsay evidence from a few of the operators. This is decidedly practical and works for economy. It is time large foundrymen paid more attention to this phase of manufacturing cost, for nowhere is it easier to save or lose large sums than in the cleaning operations where grinding wheels are used.

Here is an example which shows that it is worth while to keep adequate grinding records. A certain large producer of draw-bars was using a hard wheel, 10-W alundum. It had fairly long life and turned out a large number of bars before it was used up. On the other hand, the grinders were continually complaining that they had to work too hard and dress too often. Finally the grinding wheelmakers were called into consultation and a test carried out with several different grains and grades of wheel. The result was the choosing of a 10-U alundum wheel, one grade softer than the W. The complaints ceased as soon as this wheel was put into general use in the foundry, and although the wheels were used up faster, the production was greatly increased and the overhead correspondingly reduced. A brief analysis of this will show up the facts to better advantage:

	Hard Wheel. 10-W Alundum	Soft Wheel. 10-U Alundum
Grinding cost per ton ground	$0.49	$0.55
Total number pieces ground	1800	800
Pieces ground per hour	8	10.2

The use of the softer wheel increased grinding cost 12 per cent., but increased production 27 per cent. and lowered overhead charges because of the increased tonnage turned out in the same time with the same equipment.

Every foundryman who operates a foundry of any size should try and work out a system that would apply to his particular conditions. Let him consult the wheelmaker if necessary and take advantage of whatever experience he has acquired in handling many similar problems. It does not cost very much to investigate, but it is decidedly expensive to continue operating year after year with inefficient and wasteful methods of snagging and cleaning.

Make Your Wheels Safe

A discussion of grinding wheel economy would hardly be complete without some mention, at least, of the necessity of making the use of this tool safe. It is not economy to allow the work to get jammed in between the wheel and the rest, because the wheel undoubtedly would be broken. This is prevented by keeping the rests adjusted close up to the face of the wheel. It is not economy to have one or more grinders going to the hospital every little while to have a foreign body removed from the eye. This can be prevented by supplying an approved type of glass goggle, making the men wear them while grinding. Much trouble also has been caused from flying pieces of chilled iron dresser cutters, which break in the dressing operation. This can be eliminated by using hooded dressers. State laws are beginning to call for closer attention to such features.

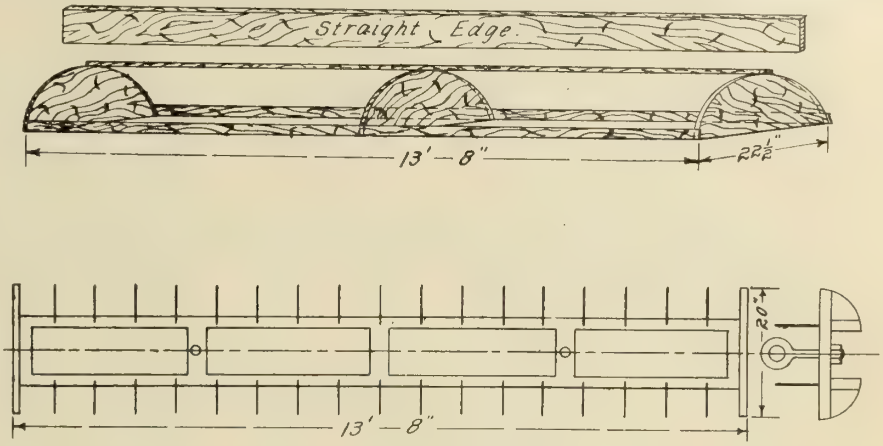
Apart from the humanitarian side of this question, it is undoubtedly more economical to employ safeguards where rapidly revolving grinding wheels are used than to trust to chance that there will be no accidents. The cleaning of castings is heavy and wearing work at best, and the least that the foundryman can do is to make the working condition as safe and bearable as possible.

MAKING LARGE PIPES WITH HALF DRY SAND CORES

By Joseph Crowe

The difficulties encountered in the accomplishment of certain operations become additionally emphasized when such work must be performed in localities where the necessary equipment is conspicuous by its absence. Having received an order for a number of large cast iron pipes, 22½ in. inside diameter, and in various lengths ranging from 3 to 12 ft., the necessity of making these without adequate facilities required the adoption of methods that would probably be considered obsolete in the more modern equipped foundry. The moulds were constructed without any unusual difficulty but the making of the cores required some study owing to the core oven being out of reach of the shop crane, the latter being a very crude appliance. The work was performed in the following manner:

The core was made the full length with 10 in. prints on the pattern; the frame was constructed by using two semi-circular pieces 22½ in. in diameter and tied by means of side pieces to give a length of 13 ft. 8 in., an ordinary straight edge being utilized to sweep off the surplus sand. The middle portion of the core was made up of pieces of furnace coke. The supporting centre for the core was made of cast iron with wires cast in to tie and support the sand. When the half core has thoroughly dried, it was placed on chaplets in the mould in the desired position, no particular attention being given to the uneveness of the joint. The edge of the upper surface of the half core was well smeared with paste and over this was placed, sheets of good strong paper, such as is found in ordinary magazines; these are placed on so that they overlap each other, like shingles on a roof and covering the space into which the iron is to be poured.



METHOD OF MAKING CORES.

The upper half of the core is then constructed in the same manner as the first half but in its position on the top of the piece now in the mould. The frame is placed and located central and the coke sprinkled with clay water and afterwards built up with moulding sand, rammed firm and stickled off with the straight edge and coated with lead blacking.

The surplus sand and blacking should be entirely removed, but it is not necessary to remove the core or even take away the paper from the joint as the under portion has been well protected, the paper being burnt away when the metal is poured. The writer prefers this method of making tees, elbows, etc., large or small, to any other in use in the ordinary foundry, as it is much simpler, requires less labor and is also much safer. The casting is less liable to crack during the shrinkage of the metal. The core can be easily removed and the material saved.

ELECTROLYTIC ZINC

THE complex ore question now has been practically solved. What under old conditions was waste has suddenly become valuable. Even if only 80 per cent. of the zinc in complex ores can be recovered successfully by the electrolytic process in its present state of development, the removal of this large percentage of a deleterious element from a complex ore will simplify the extraction of the remaining more valuable elements. Western metallurgists now estimate that they can treat the so-called complex ores by the new method, crediting to the process the value from the sale of silver, gold, copper and lead, and producing zinc at a price that will compete with the retort process under normal conditions. Even had the war not broken out when it did the electrolytic zinc process would still have been developed. The directors of the Anaconda Copper Mining Company were so impressed with this belief that they authorized a series of experiments at large cost, and they were concluded under the direction of Frederick Laist. They constructed a plant that produced 10 tons of zinc per day, and later increased this to a capacity of 35 tons. They decided then to build a modern plant close to the source of power, as this is the principal item in the cost of the process, erecting the largest zinc refinery by the electrolytic process in the world at Great Falls, Montana, U.S.A. The plant as designed will consist of five units. Late in December, 1916, three units were in operation producing 95 tons of metal per diem, assaying 99.92 per cent. zinc. The completed plant will have a capacity of from 160 to 175 tons daily. During the experiments in the test plant at Anaconda the process originally proposed by Laist and Frick was much simplified, consisting essentially of the following steps: First, careful roasting of the concentrate at temperatures not exceeding 730 deg. Cent.; dissolving the zinc, together with a little iron, by spent electrolyte in Pachucta tanks. A small amount of manganese dioxide is added to oxidize the iron, which is then precipitated by powdered limestone, bringing down any arsenic or antimony that may be in solution. This is leached through Oliver filters, containing only zinc sulphate, with a little cadmium and copper, is treated with zinc dust and again filtered, the filtrate being the pure zinc-sulphate solution which is sent to the tank room. The anodes are of pure lead and the cathodes of pure aluminum. Deposition goes on for 48 hours only, when the zinc is stripped from the cathode sheets and melted into slabs.

ONE of the serious difficulties in the melting of copper in an open coke fire is the absorption of sulphur which will take place. Copper carelessly treated in this way will smell strongly of sulphur dioxide in cooling, in which event it is useless for casting until the sulphur has been removed.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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YOU CAN'T FOOL NATURE

MORE than ordinary interest attaches to the report that the claims of the Armenian inventor named Giragossian have not been substantiated before representatives of the Federal Government. Some time ago the inventor claimed that he had discovered a fuelless energy-producer which would supply all the energy needs of the world and after a scene took place in Congress, that body was sufficiently impressed to pass a bill providing for a test which has just been completed.

Five of the leading scientists of the United States were selected by Secretary Lane from a list of fifteen submitted by Mr. Giragossian and only they and the inventor were in the room during the test.

The entire proceedings from the start have been quite out of the ordinary and much criticism has arisen in the technical press regarding the probable success of what many claim to be a fake.

Nature is absolutely just and cannot be fooled into giving something for nothing. The law of action and reaction finds almost more explicit demonstration in energy production than in any other field of physical science, and it would be strange, indeed, if some revolutionary method of power generation has remained in obscurity all these years while many of the cleverest brains in creation have been passing over, under, and round about its hiding place, only to be brought to light by some hitherto unheard of individual.

NEW WORLD VALUE OF MANUAL WORK

THERE used to be a current phrase which, in the new scale of transposed values, has fallen into desuetude; the term was contemptuous and its use proof of a lack of understanding on the part of the user—the phrase was, common working man.

The appellation was given indifferently to all manual workers by those unable to discriminate, and was justifiably resented by some of the most intelligent members of society.

Not so long ago it appeared that the line of demarcation was drawn between different classes solely on the ground of manual work irrespective of quality. If the war has done nothing else, it has educated the general public so that no such misconception can become current hereafter.

The truth is that the phrase separated producer from non-producer—the maker from the man on the make—for while brains can employ numberless indirect tools it is the manual worker who after all carries into being the work of designer and expert, to say nothing of the commerce founded on his toil.

The majority of men are common in that they are human, and it is the lot of most to perform common tasks—the word does not imply inferiority but rather equality. Moreover, there are only two classes in the community, those who work and those who idle, and the man who works keeps all. Man is a term of dignity and to claim the title involves much more than most critics allow. To be the man for any particular purpose is a distinction, so that the term with its implied reproach has a validity it were well to claim, not avoid.

It is upon the broad back of the common working man, that industry and national well-being rest. The manual worker is the most indispensable in the whole community, in mechanism is certainly at least the equal of most. For the combination and interplay of muscle and mind demanded by skilled manual work makes for a satisfying life, it involves both bodily and mental health and contributes directly to both. After all perhaps to be healthily tired enough to sleep soundly is among the most welcome of gifts and in this the mechanic having exercise of brain and body has a pull over many more envied men.

NATIONAL CONCENTRATION

ALMOST four years of warfare have removed most of the national hesitation, nervousness, indecision and ignorance which came to light occasionally as the tide of fortune ebbed and flowed in the great struggle. Periods of elation and depression have alternated. When the United States entered the war spirits ran high, to gradually subside awaiting definite accomplishment by our big Ally.

It was presumed by many, that having the benefit of British and French experience, plus American hustle, things would be doing soon. Despite the disappointment experienced by those expectant enthusiasts, the work of the States during the last year has been on a colossal scale, characterized by a deliberateness of action and actuality of accomplishment which in days to come will be more than ever appreciated. Treachery and treason are best dealt with silently.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

ELECTROPLATING MILITARY SUPPLIES

A conference was held recently at the Bureau of Standards, Washington, for the purpose of exchanging information and opinions with a view to correlating and improving the methods of specification and inspection of plating as applied to military supplies. In order to avoid subsequent confusion or uncertainty as to the conclusions of the conference, certain definite recommendations were proposed and carried without any dissenting votes. It should be borne in mind, however, by all concerned, that such recommendations are only of an advisory nature, and in no way mandatory upon those agencies concerned with the specification or inspection of plating, by whom they will, however, no doubt receive serious consideration. Of necessity, the details of specification for each class of plating, or each kind of supplies, must be governed by a number of factors, which do not apply equally to all materials.

The definite recommendations of the conference may be briefly summarized as follows:

1. For protection of iron and steel against corrosion, only zinc coatings should be employed.
2. Where a black finish upon metal is required, a black nickel finish should be specified.
3. It is not practicable to specify the composition of solutions or conditions of operation to be employed for plating.
4. In the preparatin of steel and iron for plating, sand blasting should be given preference to pickling.
5. Some form of corrosion test, such as, e. g., the salt spray test, should form the primary speicification for the quality of zinc plating; the quantity to be suggested only as a secondary specification.
6. Where the quantity of zinc coating is to be suggested or specified, it should be expressed in terms of weight per unit area (or piece) as determined by some stripping test.
7. If possible, some arrangement should be made for the employment of one or more experienced platers to serve as general plating advisors on military supplies.

The reasons for, and application of, the above recommendations as brought out in the conference will be briefly discussed. Further details, if available, may be obtained by inquiry addressed to the Bureau of Stannards.

1. Use of Zinc Coatings.—Numerous exposure and accelerated corrosion tests have confirmed the superior value of zinc coatings over copper, nickel, or brass coatings for protection against corrosion. In view of this fact, it seems highly important that wherever protection of steel against corrosion is an important factor, zinc coatings should be employed. (Note—While this conference was concerned only with electroplating, it should be borne in mind that satisfactory zinc coatings may be produced by hot dipping, sherardizing and electroplating, so-called "electrogalvanizing.")

2. Black Finish—It was pointed out that there is at present some confusion and uncertainty regarding the methods to be employed for producing a black finish on metal parts, since the farious methods are not equally applicable, and do not always produce similar results. For the sake of uniformity and simplicity, the black nickel finish is therefore recommended. It may be applied direct to copper, brass or bronze, and to steel or iron, if preceded by a coating of copper, brass or zinc. Where protection against corrosion is required, the use of zinc for the intermediate coat is suggested.

3. Composition of Plating Solutions.—Desirable as it might be to insure uniformity of product by specifying the composition of plating solutions and conditions of operation to be employed, such a course is entirely impracticable, for the following reasons: (a) The best conditions of operation have never been definitely determined. (b) A large number of plating plants have neither the equipment nor experience necessary to analyze the solutions and control the conditions of operation. (c) Most platers have been accustomed to certain solutions and conditions of operation, and would find it difficult to obtain satisfactory results under new conditions. (d) Restricting the composition, etc., might exclude many satisfactory processes, and would discourage efforts to improve conditions of operation. Illustrations were given in the conference of the confusion arising from attempts to specify the exact composition, e.g., of solutions for black nickel finish.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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Vice-President—James Vallier, 701 Crawford Street, Toronto.
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PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

4. Sand Blasting versus Pickling.—It has been frequently shown that under some conditions serious weakening or embrittlement of steel may be produced during the pickling and plating operations. This effect, presumably due to the occlusion of hydrogen, is a surface effect, and is therefore more serious the smaller the cross-section, so that on fine springs, etc., pickling cannot be used. Experiements are in progress at the Bureau of Standards to determine the magnitude of such efforts upon steel rods of various sizes and compositions. The results so far obtained upon 3/16 in. rods indicate that pickling under usual conditions reduces the elongation by about 10 per cent., while the effects of plating itself are generally much less. In view of this fact it appears desirable to replace pickling by sand blasting (or sand rolling) whenever possible.

5. Corrosion Tests.—Where zinc plating is applied to steel to produce resistance against corrosion, it is obvious that some form of corrosion test is the only real criterion of the quality of the coating, since the resistance furnished by a given quantity of zinc depends on a number of factors; e. g., the structure, uniformity, continuity, and adherence of the coating, all of which may in turn be influenced by the thoroughness with which the object is cleaned prior to plating. At the present time the "salt spray test" is probably the most reliable means of testing the resistance to corrosion afforded by a zinc coating. In practice the coating should be required to withstand corrosion for (a specified number) of days when exposed continuously at room temperature to the spray of 20 per cent. (by weight) sodium chloride solution. The number of days may vary with the needs; e. g., two or three days for articles subjected to moderate exposure, or four days or more for extreme exposure; e. g., on marine fittings. The essential features of the salt spray test to produce fairly uniform results are as follows:

Conditions for the Salt Spray Test

The salt spray test may be conducted in any convenient non-metallic bor or vessel provided with an inclined cover so as to prevent dripping of condensed liquid upon the specimens. A box constructed of Alberene stone, glass, stoneware, or wood coated with bituminous paint, may be used.

The 20 per cent. salt solution is prepared by dissolving 20 grams of sodium chloride (commercial table salt) in 80 c.c. of water, or 1 pound of salt in 2 quarts of water. The spray may be produced by any form of air injector which will yield a very fine mist. An air pressure of 6 to 10 pounds per square inch will probably be required. The compressed air should first be passed through water in order to remove dust or grease and to saturate it with water vapor and thereby avoid evaporation of the salt solution. A glass base plate should be so placed as to prevent the spray from blowing directly against the specimens. The articles to be tested should each be suspended or supported, for example, from glass rods, in as nearly a vertical position as possible, and should not be in contact with metal. They should be removed and washed off at 24-hour intervals or at the end of the specified period of test, and examined for the presence of red or yelow iron rust, the first appearance of which marks the conclusion of the test period. Valuable information may, however, be frequently obtained by continuation of the test to determine the extent of the corrosion on longer exposure.

It is recognized that a simpler and more rapid form of corrosion test to determine the quality of zinc coatings is highly desirable. The Preece test (immersion in copper sulphate solution) was discussed at some length in the conference, and it was generally agreed that while it is of some value under strictly uniform conditions to indicate the thickness or distribution of the zinc coatings, the results of the test are not sufficiently reliable to warrant its use in specifications.

6. Quantity of Coating.—In some cases it may be desirable to supplement the salt spray requirement by a statement of the quantity of zinc coating probably necessary on a given article to produce the desired resistance. The quantity of zinc coating on any small articles may be quickly determined by a stripping test, e. g., by lead acetate or antimony chloride solution, and may serve as an indication of whether the coating is of uniform weight on different samples, and approximately equal in amount to the coating on similar specimens which have passed the salt spray test. For irregular or threaded parts, the antimony chloride method is recommended. It is carried out as follows: A sufficient number of specimens should be used in each test to have an area of not less than 25 sq. cm. (4 sq. in.). They are weighed (to the nearest milligram) and then dipped in 100 c.c. (or more if necessary to cover the specimens) of concentrated hydrochloric acid (specific gravity 1.20) to each 100 c.c. of which has been added 5 c.c. of a solution made by dissolving 20 grams of antimony trioxide in 1,000 c.c. of concentrated hydrochloric acid. The same portion of hydrochloric acid may be used repeatedly up to five times, by adding before each immersion an additional 5 c.c. of the antimony chloride solution. The samples are immersed in the solution for one minute. They are then washed and scrubbed in running water to remove the deposited antimony, and are dried and reweighed. The loss in weight represents the weight of the zinc coating, which is calculated directly to grams per square decimeter; or to ounces per square foot by multiplying the g/dm^2 by 0.328 (or for practical purposes, by dividing by 3). Often it may be most convenient, on irregular shaped parts, to express the weight in grams (or milligrams) per piece, thereby avoiding uncertainty as to the exact area of a specimen.

7. Plating Advisors—The need for the services of experienced platers to assist in the specification and inspection of plating work is apparent. In view of the fact that plating on different materials, and for different branches of the Government, is often conducted in the same plant, and even in the same tanks, there are certain advantages in having such persons represent jointly the military agencies. On the other hand, it is important that there should be no conflict in the functions or activities of such general plating representatives, and the regular inspection staff of the War and Navy Departments. It was therefore suggested that, if possible, one or more "plating advisors" should be employed, e. g., under the supervision of the Bureau of Standards, to visit plants engaged in the plating of military supplies, and to make recommendations, through the appropriate inspection services, for modification or improvement of plating processes. Such a plan is now under consideration.

In addition to the above subjects, there were a number of important points discussed, upon which no definite recommendations were made. Discussion of supplemental inert coatings to protect the zinc coatings from attack, indicated that while baked japans adhere much better to electrogalvanized than to hot galvanized surfaces, baking at high temperatures may loosen the zinc coatings. The use of air drying enamels was therefore suggested. Application of paraffin, e. g., by dipping zinc plated articles in a mixture of paraffin and paraffin oil, or paraffin and resin or resin oil, heated above 100 deg. C. (212 deg. F.) was also recommended by a number of persons.

Considerations of the tolerances necessary and permissible upon threaded or other dimensioned parts, to allow for the thickness of metallic coatings, showed that the maximum tolerance possibly required (e. g., 0.0025 in. on each surface) will not cause sufficient weakening of the threads as to be objectionable. For most plating applications it is probable that a tolerance of 0.001 in. on each surface will be sufficient.

Questions and Answers

Question—A large number of small brass castings recently received for oxidizing absolutely refuse to acquire the finish we desire. After successfully finishing other castings in the solutions tried on the rebellious castings, we conclude that the composition of the casting is the cause of our failure. Can you venture an opinion as to the possible alloy, and a method of obtaining an oxidized surface on these castings.—H. & M.

Answer—It is quite evident that the castings contain an appreciable percentage of aluminum; ten per cent. would interfere with certain oxidizing processes. You may electro-plate them with silver or copper and finish as is usual for oxidizing. The aluminum will not interfere with the adherency of the electro-plate unless exceeding ten per cent. of the mixture.

* * *

Question—Will you please advise me whether it would be advisable to electrotin sheets of copper which are to be used to make floats for use in fresh water.

Answer—We do not advise tinned copper for the purpose you mention. Galvanized sheet iron would be preferable. Experiments with tinned copper indicate unsatisfactory corrosion resisting properties of such material. If copper is specified, we would prefer to recommend using the metal free from other metallic coating.

* * *

Question—I would be grateful to you for a formula for blueing steel. I wish a rather bright blue color and a coating which will protect the steel from rust to some extent.—C. G.

Answer—If your steel goods or parts to be treated are small, tumble them in sawdust until quite clean and bright. In any event, the surface of the steel must be uniformly clean and, if bright, the finish will be better. Unclean surfaces will result in streaks, spots or mottled effect. Wash the steel in strong, clean alkaline solution for final cleansing, then immerse in a hot solution of the following composition:—Water, 1 gallon; sodium thiosulphate, 2½ ozs.; lead acetate, 2½ ozs. The colors run from golden to red and finally blue in only a few seconds, and to ensure best results the operation must be carefully watched and the articles removed at the proper time, which is when the blue color becomes quite clear; longer immersion cause a grey or blackish color to form. In order to obtain greater protection from corrosion, the articles may be either brass or copper plated in a bright plating solution, and the blue color produced as a final finish. After blueing, rinse well, then immerse in a hot water bath containing 4 ozs. of white gelatine per gallon of water. Dry in drying chamber or by compressed air.

* * *

Question—Kindly inform me how I can prevent the formation of cloudy films on highly polished brass surfaces, after washing the polishing compound stains off.—K. P.

Answer—Firstly, a good polishing or buffing compound will leave no stain on brass surfaces. If after washing the brass, there is a noticeable tarnish, the article is rinsed in clean running water an dimmediately immersed in a solution of cream-of-tartar (5 ozs.), and water (1 gal.). To dissolve the chemical, heat the water, but when used as a dip it must be cold to yield best results. Dry in fine hot sawdust, direct from the dip without rinsing. This solution is very effective for the removal of the brownish mottled stain which usually is seen on brass which is rinsed and dried direct from the bright acid. In this case the cream-of-tartar treatment follows the second rinsing after acid dipping. Brass surfaces subjected ot this treatment will remain uniformly bright for a great length of time, while brass which is not so treated will tarnish badly very quickly.

Question—I would like some information regarding the adaptability of concrete tanks for nickel plating purposes. I understand that nickel solution will penetrate where water alone will not, and that the crystallization of the liquid eventually creates havoc with the container at the point of leakage. If this is true, would not the concrete prove less durable than wooden tanks protected within by asphaltum.—D. G. R.

Answer—Concrete tanks, if properly built, are superior in all respects to any other kind of tank for nickel-plating purposes. They do not rust or rot. The concrete mixture should be in proportions, one part Portland cement to one and one-half parts clean but rather fine sand to three parts screened gravel or finely broken stone. A tank in order to withstand the action of the solution and not leak, should be built by laying the concrete without stopping. Even then there are other essentials which, if disregarded, will produce leaky tanks. The concrete must be mixed so wet that it will flow over and around the metal reinforcements and against the forms. The materials for the concrete must be very carefully proportioned and the stones small enough to pass a ¾-inch mesh screen. A concrete made by using a very clean screened gravel makes a denser concrete than broken stone? It flows into place better and is not so liable to have voids and stone pockets which let the water through. Square tanks do not stand water pressure so well as round tanks because the sides tend to bulge, but they are all right if not more than 4 feet deep and 8 feet long, or deeper tanks may be set in the earth or an extra heavy base built to strengthen the sides. Build outside forms 12 inches wider, 12 inches longer and 6 inches deeper than the inside of the finished tank. Set mesh reinforcements, or else ¼-inch rods running both ways and 6 inches apart, in bottom of tank and 9 inches apart in the sides. Allow the vertical rods to project down into the bottom and the bottom rods to project into the sides. Tie horizonal rods to vertical rods by 1/16-inch soft wire. Place the inner form 4 inches from the outside form, this form can rest on iron pins driven into the ground. Grease the forms thoroughly. As the concrete is placed in the bottom, lift the reinforcement a little to allow the concrete to get under it. When filling the wall, use care to keep the reinforcement in place. By working careffuly. The inside form may be removed as soon as the concrete has become dry on top, say, in two or three hours. A better plan is to leave it for two or three days and knock the form to pieces. Leave the outside form in place for three or four days. After the concrete has set and the forms are removed, paint inside of the tank with pure cement mixed with water to the consistency of cream and brush in well. This should prevent leakage, but it is advisable to season the cement by wetting it two or three times per day for at least one week after removing the forms, and do not fill with solution until tank is two weeks old. Acid solutions are injurious to green concrete, but after proper seasoning it is proof against injury. Thin walls to concrete tanks for any purpose are liable to prove troublesome even when built in warm buildings, because concrete expands and contracts with changes of temperature just like other materials. If you object to the natural surface of the concrete being exposed to the solution you may cover it by coating with asphaltum as is the custom in preparing wooden tanks; the asphaltum may be either ironed smooth or smoothed by means of a blow-torch. We may add, that the thickness of concrete here given is only required to imbed the reinforcing steel and to make the tank watertight, and should vary with the height of the tank, but not necessarily with the diameter.

* * *

Question—Will you please let me know which is the best material to use for making a silver solution. Chloride of silver or cyanide of silver?—J. H.

Answer—Cyanide of silver is the better material. It is of special value when heavy deposits are required and is used by all manufacturers of high grade flat and hollow-ware. It is more expensive than the silver chloride. For ordinary silver-plating the chloride will give equally good results as the cyanide.

* * *

Question—The superintendent of the factory where I am doing the plating wants me to try out hot nickel-plating. I have no instruments, such as voltmeter, etc., and have no idea how hot the solution should be used or what it should contain. Shall be thankful for any little help you can give me.—F. M.

Answer—Your superintendent is taking the right course by requesting a trial of hot nickel plating, but he must equip the tank properly if he wishes satisfaction. It is bad enough to operate a cold solution without proper measuring instruments, the operation of hot solutions without instruments would be much more difficult. Get a voltmeter, ammeter and a crown rheostat large enough to carry the current you will use; also get a hydrometer, thermometer, and a few books of litmus paper. Make the nickel solution by dissolving 2 parts single nickel salts, and 1 part double nickel salts in sufficient water to make the volume required. Add 3 oz. magnesium sulphate, and 3 oz. boric acid per gallon of solution. Operate at about 150 degrees Fah. The solution will increase in electrical conductiveity about 2 degrees with a rise of 1 degree in temperature. Filter the solution when it becomes foul.

* * *

ELECTROLYTIC PROCESS OF NICKEL REFINING

The Bessemerized copper-nickel matte, containing about 47 per cent. nickel, 33 per cent. copper, and 20 per cent. sulphur, with usually less than 0.4 per cent. iron, is granulated and roasted. It is then leached with a 10 per cent. solution of sulphuric acid to dissolve the major part of the copper. The residue is melted and cast into anodes, which contain about 65 per cent. nickel and from 3 to 8 per cent. sulphur, with traces of copper and iron.

The electrolyte used for the nickel carries 45 grammes nickel, and from 3 to 5 milligrammes of copper per litre. and is supplied by rubber tubes to the cathode diaphragms. After circulation it has from 2 to 3 gm. copper per litre, and is passed over waste anodes which deposit the copper and re-supply nickel to the solution. The action of the anodes is analogous to that of pig iron in precipitating cement-copper, except that the copper is deposited by nickel instead of by iron. The amount of waste anode resulting after electrodeposition of the nickel is about 40 per cent. of the original weight, and is sufficient for rejuvenating the exhausted solutions from the nickel vats. The solutions never have to be rejected as they are sufficiently purified by the cementation.

Waste fragments, after the cement-copper has been brushed off, are crushed, roasted, leached with 10 per cent. sulphuric acid to dissolve more copper, and the residues are melted into anodes and re-electrolyzed.

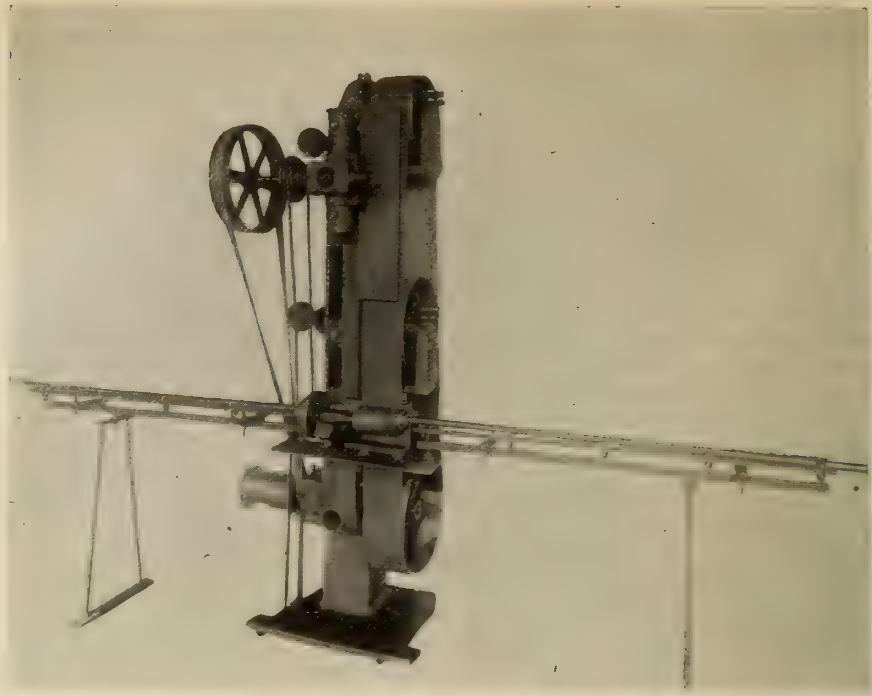
The anodes for the nickel department are enclosed in special canvas bags, stated to last 18 months. Paper diaphragms supported by common canvas at times have been substituted and have lasted 12 months. The cathodes are of iron treated with a wash of powdered graphite. The nickel deposits on both sides of the cathode-plate. These plates are arranged in parallel. The voltage is from 3 to 4 v. per tank, according to current density, which varies from 8 to 10 amp. per sq. ft. The large tanks contain 20 cathodes and 21 anodes, and the smaller tanks 10 to 14 cathodes and 14 to 15 anodes.

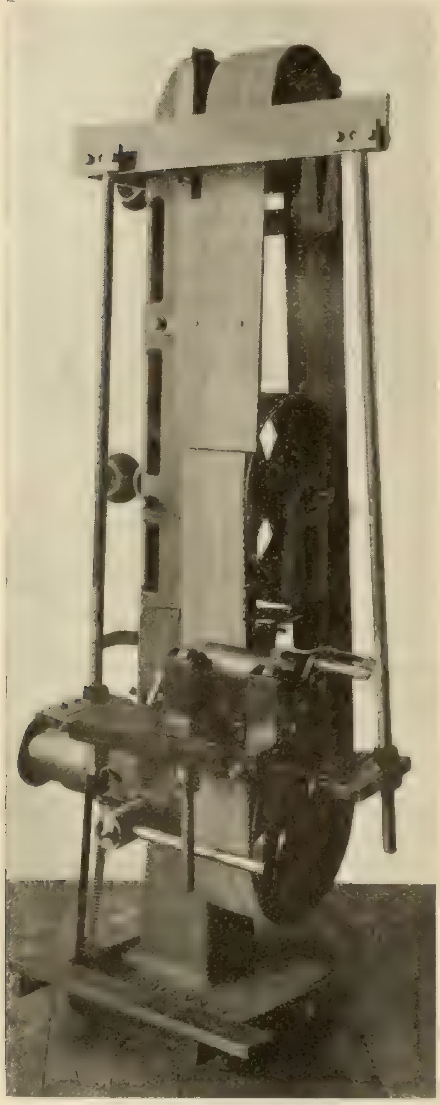
The deposition of the nickel takes about 15 days, and the sheets stripped from the cathodes weigh 20 to 30 lbs. each. They are about ⅛ inch thick, and have the usual corrugated warty appearance, but the stalactite growths are dense and give no trouble through short circuiting. The sheets are washed in weak sulphuric acid to remove basic salts, are dried, and cut into 2 to 3 inch strips for market. The metal is guaranteed 99 per cent. pure, with usually no more than 0.03 per cent. copper.

The precious metals accumulate in the anode slime, which is remelted into anodes and separately electrolyzed. thel nai slime being caked, dried, and sold for its precious-metal content. The copper is separately deposited, but on copper sheets and without encasing the insoluble lead-anodes in bags. The current density is about 10 amp. per sq. ft. at 2 v., and there are usually 9 cathodes and 8 anodes per tank. The high-tension current is first stepped down to 220 v. (alt. cur.) and then converted to direct current at a voltage between 160 to 170 v.

POLISHING AND FINISHING MACHINES

THE polishing and finishing machines developed by the Blevney Machine Co., Greenfield, Mass., make use of a two-belt system of finishing with an abrasive cloth belt running at high speed over a heavy corrugated leather cushion belt. Skilled labor is unnecessary and the process results in a remarkably high rate of production.


TYPE A.—MACHINE FITTED WITH TUBE TABLE AND POWER FEED.


TYPE A. — PARALLEL SUSPENSION TABLE AND FIXTURE FOR FINISHING 3 IN. OR 75 MM. SHELLS.

The Type A machine is built up on a heavy cast iron column providing the necessary rigidity for a high-speed machine. Steel ways are attached to the column and the sliding frames in which the idler pulleys operate travel on these ways. The main belt pulley is attached to a shaft running in suitable boxes in the lower part of the column of machine and the driving pulley is attached to the other end of this shaft. The patent cushion belt is run over the main pulley and the idler next above, travelling at a speed of 7,000 feet per minute. The cloth abrasive finishing belt is placed over the cushion belt running from the main pulley to another idler pulley operating in frame at top of machine. The idler pulley frames in both cases are governed by weighted levers having a fulcrum journaled wheel, and a steel pinion forms connection with a steel rack attached to the frame. These weighted levers should be in a horizontal position when the machine is in operation and to bring the levers to this position a spring is provided holding the pinions in engagement with the rack. By pulling the fulcrum against the action of this spring the pinion will become disengaged and the lever may be moved to any desired position, the spring restoring the engagement between pinion and rack.

The alignment of the two belts may be controlled by means of hand wheels operating on the idler pulley boxes, these wheels serving to tilt the pulleys so that the position of the belts may be changed as desired.

A suitable table or stock rest is provided for holding the stock and for the application of fixtures and attachments. A spring platen or pressure bar is applied back of the cushion and finishing belts. The action of this pressure platen is controlled by a foot treadle and stops are furnished to limit the forward and return movement. The face of the platen is made to suit the work to be finished, thus, for plain flat work the platen has a plain face, while for finishing tubes or round pieces parallel strips are placed at top and bottom of platen, causing the belt to curve around the circumference of the stock being finished. Where desired the platen may be made sectional at a slight additional cost over regular construction, or special rotating platens with yielding centres can be furnished.

The adaptability of this machine to a wide variety of work is illustrated in the accompanying engravings. Fig. 1 shows the machine set up for the finishing of tubing.

Fig. 2 shows the machine set up for the grinding of the bourrelet on shells, resulting in exceptionally fast production.

A special set up is shown in Fig. 3 for the grinding of torpedo heads and afterbodies, this method having reduced the finishing time from 17 hours to less than 50 minutes.

The production of these machines is obtained through the medium of the two-belt system. The corrugated leather cushion belt runs at 7,000 feet per minute and the abrasive finishing belt which runs over it runs at a slightly increased speed, due to the enlargement of the effective diameter of the driving pulley amounting to twice the thickness of the leather cushion belt. The increased travel amounts to about 1½ inches on each revolution of the main pulley.

The increased speed of the cloth abrasive belt is neutralized in operation when pressure is applied behind the belts, with the result that the travel of the abrasive belt is somewhat retarded at point of work so that it must curve into high and low sections following the corrugations in the cushion leather belt. In this manner are obtained high points for cutting and low points for chip recess. After the belt passes point where work is held it expels the chips and resumes its normal position.

The chips are disposed of immediately as generated or cut, while in other processes the chips are rolled along over the face of the work, thus scratching or damaging work already done and causing unnecessary friction and heat. It will be seen that the two-belt system of polishing and finishing does away with unnecessary friction and thereby immediately provides for faster finishing, and at the same time a higher and more satisfactory finish.

A jointing machine is used in making

the abrasive belts endless and the method employed is such that the thickness is practically no greater at joint than at any other part of the belt, this process not only makes an exceedingly strong belt, but one which runs smoothly and evenly and does not jump over the work at the joint.

The abrasive belts as they become used are later dressed down for finishing in various stages until they are finally used for greased belts for the finest finishing. In this manner the life of a belt is extended to where the item of cost is hardly a point for consideration.

The cloth abrasive belts as compared with an ordinary buffing wheel do away with all centrifugal action upon the finishing grains where they are under strain and as compared with the disc grinder they provide a uniform speed for each cutting grain, the disc grinder grains being subject to different speeds on account of their location at different points from centre of disc. It is also well to note that there is no loss in abrasive material through the use of the cloth finishing belts, while a considerable portion of the abrasive grain is lost in operation on the ordinary hard wheels and discs.

OPEN FLAME FURNACES

The following letter was received by the Dixon Company, and it should be of much interest to foundry men, as it deals with a subject that has been discussed pro and con considerably during the past year.

The correspondent has had a large amount of experience in the use of both crucibles and open flame brass melting furnaces, therefore the opinion expressed by him may be considered as coming from one who has made a careful study of the subject and knows whereof he writes.

"Supplementing our talk on the subject of Open Flame Furnaces, I would think them to be the most expensive and inefficient appliances ever put in a brass foundry, for the following reasons:

"They take a large amount of fuel, if not as much as the crucible furnace; their linings are expensive, and if they are not as expensive as crucibles, they are nevertheless very expnsiv.

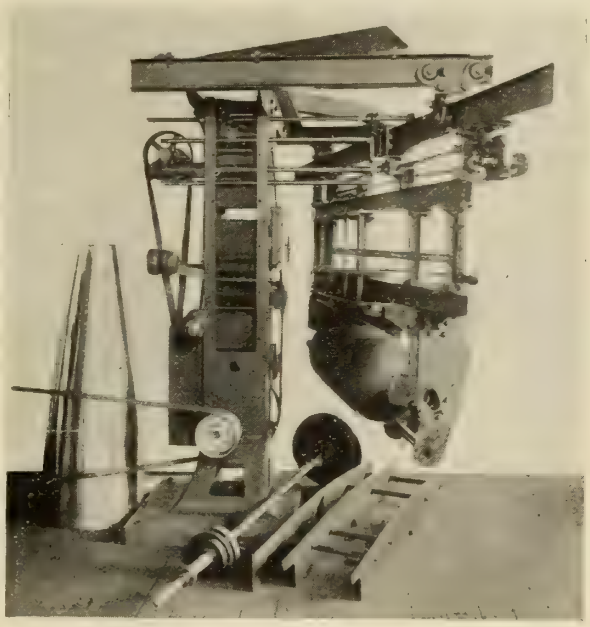
"Worst of all is the condition of the metal after having been melted and exposed to this poisonous oxidizing flame, and I do not understand how a company like a railroad company that are making their own castings can afford to continue the use of such a furnace in the face of the fact that the metal deteriorates so fast and to such an extent that it is only a matter of a few melts until the brass has reached a stage of inferiority and the metal is little if any better than junk.

"While it is a fact that copper and other non-ferrous metals can and are being melted in an open flame, such as the reverberatory furnace, we must remember that it is in the hands and under the supervision of thorougohly trained experts who can discern the slightest variation in the flame from its appearance.

"From such men we might expect fairly good work in proportion to the possibility in the open flame furnace, but nothing to be compared with what can be done where metal is protected in a crucible.

"The loss where metal is oxidizing at the rate it is in an open flame furnace must necessarily be considered as a melting loss, even though the weight in pounds may appear to be suffering no loss; at the same time the oxide that has been formed and immediately absorbed by the apparent clean metal is nevertheless a loss and can be discerned only by analysis. When this stage is reached the company is junking the price of brass castings, and not scrap brass, which is, of course, a large loss.

"My prediction is when the quality and price of crucibles reach the point they were at one time in the past, the open-flame furnace will entirely disappear."



SPECIAL MACHINE ON TORPEDO HEADS AND AFTERBODIES.

GREAT BRITAIN'S TRADE PREPARATIONS

GREAT BRITAIN is making no secret of her intention to be fully prepared for the intense competition for the markets and the carrying trade of the world that the close of the war will bring, and in line with this she proposes to give permantnt direction to the energies that the war has created. In order to make the most of her resources there are now some one hundred committees at work collecting information regarding the agricultural, mining, industrial and commercial conditions of the British Empire. The work of these committees touches the life of British people in all its phases, and all sorts of questions are being asked to bring out the best way of rebuilding and reorganizing British trade. The thing is being done with true British thoroughness, and the organization of these various committees, which cover every feature of British trade, shows that Great Britain considers being prepared for what the close of the war will bring as being just as important as winning the war.

These arrangements would not be complete without a great selling agency, and to provide this the British government has created what is known as the Department of Overseas Trade, which controls the Board of Trade's commissioner service within the Empire and the Foreign Office's commercial attache's service in foreign countries. In other words it controls and will co-ordinate the sources of informatin in regard to those who have something to sell and those who are ready to buy. A large share of attention, it goes without saying, is being given to restoring Great Britain's merchant fleet and for the improvement of British harbors out the world. When the war is over it may be gathered that Great Britain will be prepared for commerce.

CLEANING BLAST-FURNACE GAS BY ELECTRICITY

THE gas that comes off from the top of a blast-furnace is too heavily charged with fine dust to be usable economically in hot-blast stoves and under boilers, and quite unfit for use in gas-engines. The older method of cleaning the gas consisted in natural precipitation of suspended matter in large tubes and chambers and subsequent "scrubbing" of the gas in washing apparatus. This had the disadvantage, so far as heating purposes are concerned, of reducing the temperature of the gas before combustion, which obviously is uneconomical. Consequently various dry-hot methods of cleaning have been introduced. One of these, which has proved very successful, is the electrical process. The gas is passed through a chamber, which need not be more than 15 to 20 ft. long, and subjected to high-tension electrical discharges, which precipitate the dust almost immediately without affecting the temperature of the gas. The dust can be handled much more conveniently than the wet "sludge" from the washers of the wet-cold process, especially if it has to undergo subsequent treatment for the extraction of valuable constituents. The method is cheap and extremely efficient. After one electrification, or at most two, the gas is fit for use as gas-engine fuel.

FROM thirty to forty crucible steel foundries are now in existence in Australia, and steel castings are being regularly produced from fifteen of them.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	28 00
Copper, electrolytic	28 50
Copper, casting	28 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	22 50
Copper, heavy	22 50	22 50
Copper wire	22 50	22 50
No. 1 machine composition	22 00	21 50
New brass cuttings	16 00	14 00
No. 1 brass turnings	15 00	15 75
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	20 50
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	31 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	20 00	13 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	7 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 47
Solder, guaranteed	0 50
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	8 95
Premier, 10¾ oz.	13 85	9 25
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50	to	$0.54
Copper	.44	to	.45
Tin	.49	to	.56
Silver, per oz.	1.05	to	1.00
Zinc	.23	to	.25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium, hydrosulphuret.	.40
Ammonium, sulphate	.07
Arsenic, white	.12
Caustic soda	.07
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	16
Nickel ammonium sulphate.	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate ......(per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals.	.05
Sodium cyanide, 129-130%	.41
Sodium cyanide, 98-100%	.38
Sodium hydrate	.04
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.			$3 25
Polishing wheels, bullneck			2 00
Pumice, ground			07
Emery composition	10	to	6- 9
Tripoli composition	06	to	9-10
Rouge, powder	.30	to	.35
Rouge, silver	.50	to	.55
Crocus composition	08	to	8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 34
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 4[illegible]

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.4
Cotton Rope, ¼-in. and up	.4[illegible]

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

TORONTO.—There is still one word that describes the busy state of trade in the machine tool, supplies and equipment business here, and that is "munitions." Dealers are up to their necks in business in many cases. Each plant that gets orders for new business wants to get production started as soon as possible, as the element of urgency and haste on the wesetrn front is transmitted in a large degree to the business passing here. Some contractors from this district are still visiting American points in connection with the securing of equipment. Canadian dealers have a very large volume of business just now, and they are working at considerable tension to cope with the situation.

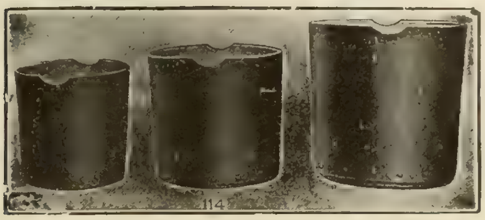
The Upward Tendency

It was stated in these columns a week ago that there would soon be an upward revision of the schedule at which chains were being traded. It has taken place and the increase amounts to two cents a pound on all grades, either B, BB or BBB. There are some 185 varieties of

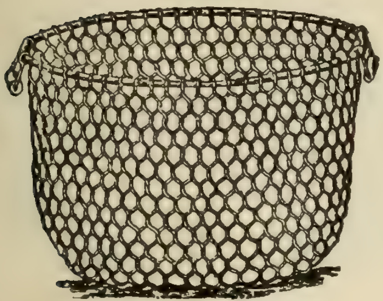
MADE IN CANADA

Headquarters for

Foundry Facings and Supplies



Highly Serviceable Foundry Ladles



Charcoal or Coke Basket

A Favorite Brush

Bench Rammer

By buying from the manufacturer you get better service than by buying through most agencies, because the manufacturer is invariably keener to serve you—and serve you right.

A few of our lines:

CEYLON PLUMBAGO No. 101

There's no better Facing used anywhere than this high-grade "Hamilton" product. If you are not using it, give it a trial.

CEYLON PLUMBAGO No. 206

is without equal for general machinery castings.

BLACK CORE COMPOUND

is guaranteed 100% pure. Users highly recommend it.

PARTING

bring customers back for more and more. Always equal to the severest test. Ask for sample.

SPECIAL STOVE PLATE FACINGS

is backed by our experience of a quarter century. It is perfect facing. You should use it.

Always well stocked for quick deliveries.

The Hamilton Facing Mill Co., Ltd.

Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

chain made and sold on the market. In fact it is a business all by itself. The American industry has a very strong influence on the Canadian market both in regard to supply and price. Immense lengths of chain are being called for at the present moment for use in the emergency fleet, and there is the added element of excessive haste in the matter. The British government will not allow the export of the hand-made variety, for which there used to be such a demand. In fact there was a time when all the navies of the world specified British hand made chain on account of the purity of the iron used in them. Even the German navy used the British chain. There has been a big inroad made on this trade in recent years by the machine-welded product, makers of the latter claiming that there is a uniformity of strength that cannot be placed in a hand-made chain. Big quantities of hand-made chain were replaced by the machine-made variety in work on the Welland Canal, when it was found that the former was not standing up under the heavy strain in dredge work, etc. Inch chain is quoted to-day at 14½c per pound against last week's price of 12¼c. and the dealer who sells it claims that he is not making as much as when it was listed at the lesser price as he cannot pass the increase in the entirety on to the consumer. In addition to the big demand the makers in the States claim that preference now goes to plate mills, and in consequence they are short of material. The tendency is for a higher price in chains, and this is likely to become more noticeable in the very near future.

Scrap Metals

There has been a fair volume of business passing in the second hand metal trade during the week, but there is absolutely nothing in the form of a feature in the whole situation. The situation in the American market is quite similar to that here at present. Steps are being taken now to have a survey taken of the scrap situation across the line, and circulars are being mailed to dealers inquiring the amount of stock on hand now and the amount they had a year ago. The inquiries also take in all lots of unprepared scrap that are being withheld from the market, principally in the form of obsolete railways, old mine heads and tipples which are not being operated, unused bridges or similar structures, old manufacturing plants not in operation—in fact any material which can be shipped to the scrap yard for preparation.

In Canada reports are sent out by dealers each month showing the amount of scrap coming into the yard and the amount sent out.

It may yet be found necessary to comb out the country to increase the amount of melting scrap coming into the market The high price of tin does not bring in any in the way of scrap. Tin stands very low in the amount of it that is recovered—in fact its principal use in that form is for the purpose of alloys.

There are not changes in prices being paid by dealers for scrap metals this week.

Non-Ferrous Metals

Canadian dealers are not much inclined to the belief that there wil lbe a higher price set for copped in United States. The suggestion has been made that there will be two prices—one for the large producer and another or higher for the small mine. Early suggestions were that companies whose cost was above a certain figure should receive a premium over the lower cost properties. Now it appears that instead of having the cost the determining factor there is a possibility that companies turning out 10,000,000 pounds of copper or less each year will receive preferential treatment over the larger mines. The reason for such a course is not readily apparent, and it is hardly likely to come to pass.

Tin may yet reach higher levels, at least that is the latest word from New York markets. Price advanes do not seem to have the effect of increasing the amount coming on the market. The only supposition is that there is none to be brought out.

TRADE GOSSIP

Becoming Scarce.—A Montreal firm is advising its customers as follows this week: "It is becoming more difficult to secure supplies of citric and tartaric acid, and particularly tartaric, English manufacturers have been and are still unable to offer tartaric for any shipment, and we understand that Italian makers are also refusing to quote. Indications point to a severe shortage and we think it would be well for our friends to look into their requirements without delay and endeavor to pick up anything which might be available from stocks in Canada."

Canadian Driver Harris Co., Ltd.—Incorporation is granted to L. O. Hart, L. Edwards, of Jersey City; P. Martin, Newark; A. Simmers, of Windsor, and J. H. Coburn, of Walkerville, for the following purposes: To carry on business as foundrymen, wire manufacturers and machinists; to carry on any other business capable of being conveniently carried on in connection with its business or calculated directly or indirectly to enhance the value of or render profitable any of the company's rights, etc. Stock placed at $150,000 and head office to be at Walkerville, Ont.

Canadian Hoskins, Limited, Walkerville, manufacturers of electric furnaces and pyrometers, are erecting a concrete and steel factory building on Walker Road, which they hope to occupy within three months. It is an L-shaped structure, 60 x 170 x 220, and will give the company the requisite facilities for the production, not only of their regular lines, such as pyrometers and furnaces, but of nickel chrome castings and wire in which they are specializing. The new factory will call for a much larger working force, and it is worthy of note that the company speedily outgrew the quarters in the Walker industrial building which they occupied about two years ago.

Big Plant Started.—At 8 o'clock on the morning of July 1 the large plant of the International Nickel Company of Canada, Limited, at Port Colborne, which has been in the course of construction the pasttwenty months, started operations. Wilbert More, only son of John More, general manager of the company, put in the first charge ,and the first metal came through the furnace at 10 o'clock, and was heralded by the company's private whistl. This plant will produce annually from twenty to twenty-four million pounds of refined nickel and twelve million pounds of copper, and is so constructed that should the necessity arise its production could be quadrupled.

Will Present Flag.—At a meeting of the Orillia Council of the Board of Trade, it was decided to offer a silk flag to the first vessel propelled by either steam or gasoline engine of more than 10 horsepower that reaches Orillia from Lake Ontario by the Trent waterway. This is following the precedent set when the Kirkfield section was opened, when a flag was presented to the first vessel to arrive from the Kawartha Lakes.

CATALOGUES

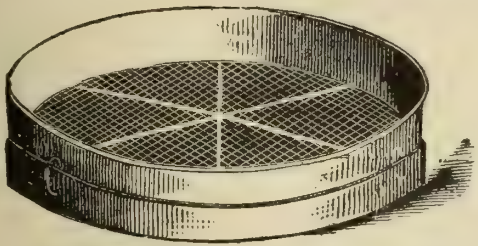
Vertical Air Hoists.—The Canadian Ingersoll-Rand Co. have just issued a new catalogue of their direct lift vertical air hoists. The booklet is well illustrated, and gives complete details of the different types of valve used for various classes of work up to five tons capacity—the dustproof single acting, the dustproof air balanced, the dustproof double acting. Complete tables are given, including a useful table of the free air consumption of the hoists.

"Lighting for Production and Safety" is the title of an interesting bulletin issued by the Cooper Hewitt Electric Co., Hoboken, N.J. The booklet, which was written by Wm. A. D. Evans, comprises the study and selection of a system of illumination with a view to ultimate efficiency of the plant. The bulletin contains much valuable information on the above subject of a technical nature, while the excellent half-tone illustrations show examples of lighting with Cooper Hewitt lamps. In addition to the above the bulletin contains a number of lighting plans of installations at large plants.

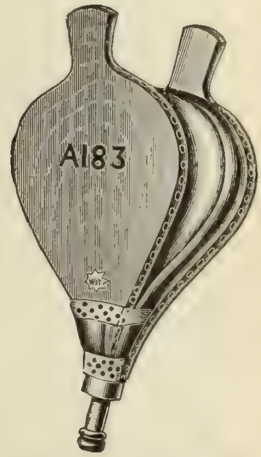
Air Compressors—32-page catalogue, coated paper, fifteen illustrations, recently issued by the Canadian Ingersoll-Rand Co., Sherbrooke, Que., describing "Ingersoll-Rogler" air compressors. The booklet gives a sketch of the development of the "Ingersoll-Rogler" valve, with particular attention to the application of the valve to large air compressors, having direct synchronous motor drive. Other special features of the "Ingersoll-Rogler" compressors described are the rolling mill engine type frames, special intercooler design and clearance controller with automatic maximum load stop.

FACINGS

Foundry Supplies and Equipment



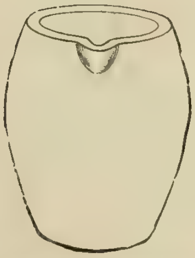
Riddles of all meshes in Brass, Galvanized and Steel



Bellows with the best of leather and workmanship

Coke Forks in different tines

Shovels in both Split and D-Handle



MORGAN'S CRUCIBLE
THE MORGAN CRUCIBLE COMPANY
BATTERSEA
LONDON
TRADE MARK

Morgan English Crucibles. All sizes carried in stock

Whiting Cupolas and equipment

The Dominion Foundry Supply Co., Limited

"Everything for the Foundry"

TORONTO MONTREAL

The Aligning and Leveling of Shafting is the title of a catalogue issued by the Kinkead Manufacturing Co., Boston, Mass. The catalogue in the opening pages deals with the amount of waste from friction, and states how the Kinkead device improves these conditions. The outfit is then described and illustrated, followed by a statement as to what has been accomplished by the Kinkead device. A considerable proportion of the catalogue is devoted to an explanation of the method of working, accompanied by numerous illustrations showing how the device is used in aligning and leveling shafting. The concluding pages contain directions for using a special level. The catalogue also contains a number of copies of testimonials and a list of users of the Kinkead device.

There are two possible results of this fuel shortage; either certain industries must close down or more work must be done with the coal available. The Engineering Experiment Station of the University of Illinois has just issued a 90-page booklet printed in four colors which shows that the average small power plant can save fifteen per cent. of its fuel by the exercise of greater care in equipment and operation. This means a saving of 12 or 13 million tons per annum if applied throughout the country.

The purpose of the publication, the title of which is "Fuel Economy in the Operation of Hand-Fired Power Plants," is to present to owners, managers, superintendents, engineers and firemen, certain suggestions which will help them in effecting greater fuel economy, and in determining the properties and characteristics of the coal purchased. Features of installation essential to the proper combustion of fuel are discussed, the practise to be observed in the operation of the plant is outlined.

The publication was prepared by a special committee of the research staff of the Engineering Experiment Station assisted by an advisory committee consisting of Joseph Harrington, advisory engineer on Power Plant Design and Operation, Chicago; Arthur L. Rice, editor "Power Plant Engineering," Chicago; John C. White, chairman educational committee, National Association of Stationary Engineers, Madison, Wis.; O. P. Hood, chief mechanical engineer, Bureau of Mines, Washington, D.C.; D. M. Myers, advisory engineer on fuel conservation, United States Fuel Administration, Washington, D.C., and C. R. Richards, Dean of the College of Engineering and director of the Engineering Experiment Station of the University of Illinois.

Only a limited supply of copies of this publication is available for free distribution. Requests for copies should be directed to the Engineering Experiment Station, Urbana, Illinois, and should specify "Circular No. 7."

◆

THE LACQUERING OF SMALL BRASS OR BRONZE CASTINGS

TO finish simply small brass or bronze castings by lacquering, it is customary first to tumble them, unless they have been machined sufficiently to remove the rough surfaces and are free from burrs. The dipping operation merely imparts a clean surface of high color and is done in a solution consisting of sulphuric acid, 1 gal.; nitric acid, 3 qts.; and a handful of common salt. When mixing these acids the nitric acid is put into a stoneware crock and the sulphuric acid poured into the nitric. The two are stirred well and then the salt is added. When replenishing the dip, 1½ parts sulphuric acid and 1 part nitric acid and very little if any, salt is put into it. The castings are cleansed in a hot potash solution and removed therefrom and allowed to cool and dry without rinsing in water. The potash forms a film over the surface of the casting, which, when cool, is dipped momentarily into the acid solution and then rinsed in cold running water. This method obviates conveying an unneccessary amount of water into the dip. The solution sometimes fails to color when freshly made and must be allowed to cool. After rinsing in cold water the castings are passed through clean, boiling water, and if of sufficient body to dry quickly, they are dried by swinging in the air or if small or thin, they should be dried in clean hardwood sawdust, which must be entirely removed either by brushing or by using a riddle. The castings then should be lacquered with as little delay as possible.

As it is essential that the castings should be perfectly clean and free from moisture, drying the castings is best done while still on the wires or wire basket holders, as that plan obviates handling. The thing to aim at is that the lacquering should follow the bright acid dipping as quickly as conditions will permit. The lacquer should be of such quality as will cover the article without affecting the lustre or obscuring the metal. A good grade of celluloid lacquer will be found to give the best results. It does not crack nor peel, and should be applied by dipping or spraying in a chamber free from dust and a temperature of from 85 to 95 deg. F. If a gold tint or other shade is desired, the coloring should be added in very small quantities. Porcelain or stoneware vessels are best for containing the lacquer while in use, although tin is used. If rainbow colors are noticeable after the first dip, a second dipping will usually remedy it. If the lacquer becomes thick, a thinner of the same grade of lacquer should be used. Green colored drops at the draining point indicate acid contamination, and the castings should be more thoroughly rinsed after bright dipping. If a drying chamber is used, it should be heated by steam if work is being done regularly, as the chances of fire are lessened, the lacquering material being inflammable. If gas is used, extra caution is required and the chamber should be of sheet metal properly ventilated.

The work should be dried slowly in the open air until all dripping ceases before being placed in a drying chamber. When the coating has set and dried, the temperature of the heater may be raised and the lacquer will thus become harder,

Classified Advertising

Advertisements under this head are charged at the rate of two cents per word for first insertion and one cent per word for subsequent insertions. Minimum orders $1.

WANTED — A USED POWER ELEVATOR, capacity 1,500 to 2,000 pounds. Canadian Hart Wheels, Ltd., Hamilton, Ontario. (c7f)

FOR SALE—WHEELOCK ENGINE, COMPound Condensing Cylinder 16 x 28 x 38, Fly Wheel 14' 6" x 34" complete with Feed Water Heater and Condenser Pump, all in good order. Will sell cheap as we are using electric power. Write—Cobourg Felt Co., Ltd., Cobourg, Ont. (c7f)

WANTED 50-60 TONS OF USED MAULING sand. Apply Box 455, Canadian Foundryman. (c8f)

SIMPLICITY DESIGN DURABILITY WORKMANSHIP The Ford-Smith Machine Company SIMPLICITY DESIGN DURABILITY WORKMANSHIP

Machines of Highest Grade for Shop and Foundry

Ford-Smith Grinders—

A few of our lines are

General Purpose Shop Grinders.
Floor Grinders (all sizes).
Water Tool Grinders (Belt or Motor Driven).
Bench Grinders.
Polishers and Buffers.
Plow Grinders and Disc Grinders.
Swing Grinders and Special Grinding Machines.

Our Catalog is yours for the asking.

The Ford-Smith Machine Co., Limited
Hamilton, Ontario, Canada

CHILLED SHOT
AND
DIAMOND GRIT

Harrison's
Chilled Shot and Diamond Grit

The perfect Metallic Abrasives for sand blasting

They *out-last* and *out-work* any sand, and save time, money and shop space.

Let us show you the *economy* of using them.

Prompt shipments—any size.

Samples free.

PURCHASE YOUR SUPPLY DIRECT
FROM HEADQUARTERS

HARRISON SUPPLY COMPANY
5 and 7 Dorchester Avenue Extension BOSTON MASS. U.S.A.

Becoming a Bigger Man

WHAT is the difference between some men you know and others known to you? Why are some men earning $3,000 a year and some $30,000? You can't put it down to heredity or better early opportunities, or even better education. What, then, is the explanation of the stagnation of some men and the elevation and progress of others?

We are reminded of a story. A railroad man, born in Canada, was revisiting his home town on the St. Lawrence River. He wandered up to a group of old-timers who sat in the sun basking in blissful idleness. "Charlie," said one of the old men, "they tell me you are getting $20,000 a year." "Something like that," said Charlie. "Well, all I've got to say, Charlie, is that you're not worth it."

A salary of $20,000 a year to these do-nothing men was incredible. Not one of the group had ever made as much as $2,000 a year, and each man in the company felt that he was a mighty good man.

Charlie had left the old home town when he was a lad. He had got into the mill of bigger things. He developed to be a good man, a better man, the best man for certain work. His specialized education, joined to his own energy and labor sent him up, up, up. To put it in another way: Charlie had always more to sell, and the world wanted his merchandise—brain, skill and ability. Having more to sell all the time, he got more pay all the time.

Charlie could have stayed in the old home town; could have stagnated like others; could have been content with common wages. In short, Charlie could have stayed with the common crowd at the foot of the ladder. But Charlie improved himself and pushed himself, and this type of man the Goddess of Fortune likes to take by the hand and lead onward and upward.

Almost any man can climb higher if he really wants to try. None but himself will hold him back. As a matter of fact, the world applauds and helps those who try to climb the ladder that reaches towards the stars.

The bank manager in an obscure branch in a village can get out of that bank surely and swiftly, if he makes it clear to his superiors that he is ready for larger service and a larger sphere. The humble retailer can burst the walls of his small store, just as Timothy Eaton did, if he gets the right idea and follows it. It is not a matter of brain or education so much as of purpose joined to energy and labor. The salesman or manager or bookkeeper or secretary can lift himself to a higher plane of service and rewards if he prepares himself diligently for larger work and pay. The small manufacturer, the company director, the broker—all can become enlarged in the nature of their enterprise and in the amount of their income, — by resolutely setting themselves about the task of growing to be bigger-minded men.

Specialized information is the great idea. This is what the world pays handsomely for. And to acquire specialized information is really a simple matter, calling for the purposeful and faithful use of time. This chiefly.

One does not have to stop his ordinary work, or go to a university, or to any school. One can acquire the specialized information in the margin of time which is his own—in the after-hours of business. Which means: If a man will read the right kind of books or publications, and make himself a serious student at home, in his hours—the evening hours or the early morning hours—he can climb to heights of position and pay that will dazzle the inert comrades of his youth or day's work.

IF business—BUSINESS—is your chosen field of work, we counsel you to read each week THE FINANCIAL POST. It will stimulate you mentally. It will challenge you to further studious effort. It will give you glimpses into the world of endeavor occupied by the captains of industry and finance. With the guidance of the POST, and with its wealth of specialized information, you, a purposeful man, aiming to go higher in life and pay, will find yourself becoming enlarged in knowledge and ambition, and will be acquiring the bases and facts of knowledge which become the rungs of the ladder you climb by.

It is the first step which costs. But this cost is trivial—a single dollar. We offer you the POST for four months for a dollar. Surely it is worth a dollar to discover how right we are in our argument. If you have the will to go higher in position and pay, sign the coupon below.

THE MACLEAN PUBLISHING COMPANY, LIMITED,
Dept. CF —143-153 University Avenue, Toronto.

Send me us THE FINANCIAL POST for four months for one dollar.

Money to be enclosed remitted

Signed ....

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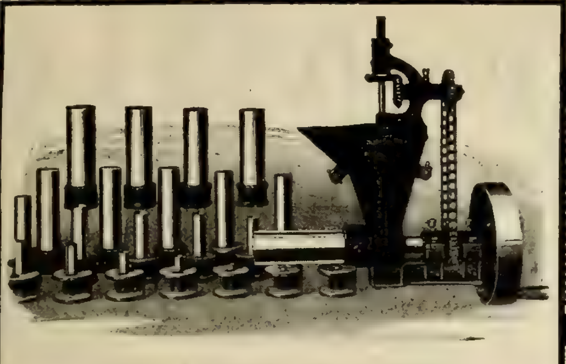
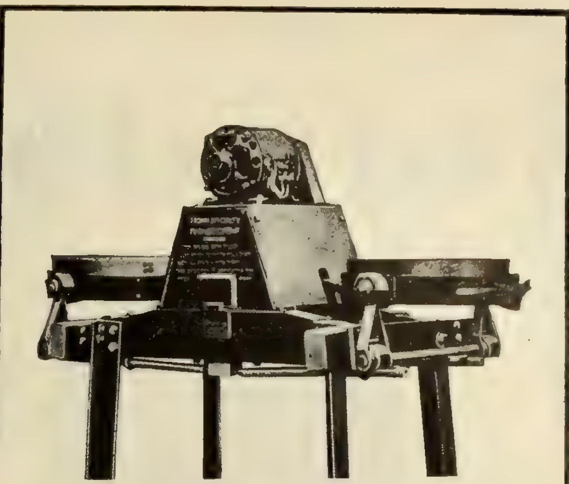
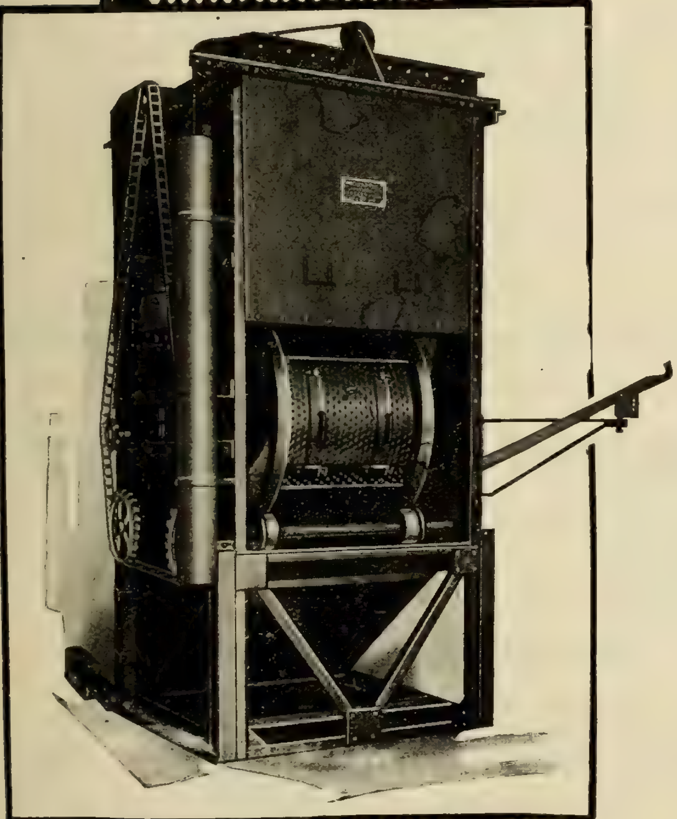


Style A Hammer Core Machine



Electric Duplex Shaker



BROWN

Money-Makers

FOR FOUNDRIES

The Duplex Shaker will be a money-maker in your foundry because it saves half of the sand-labor costs. It sifts sand quicker, better and cheaper than it can be done in any other way. Either electric or pneumatic.

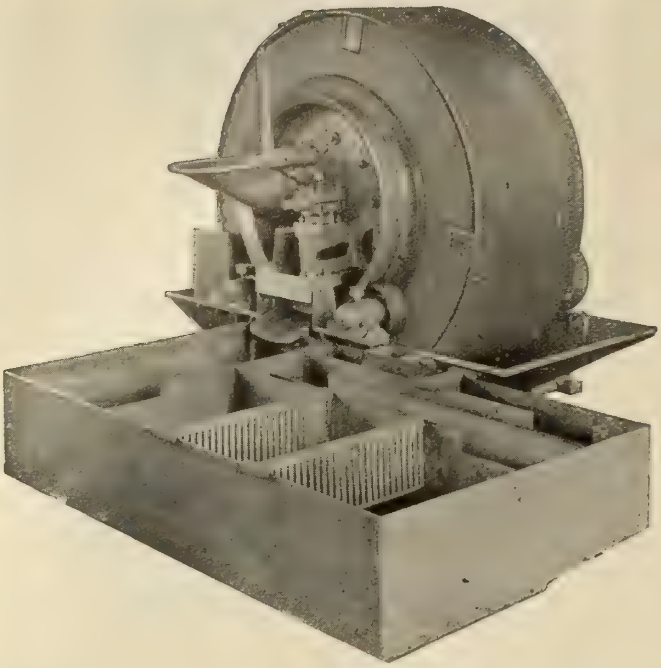
The Hammer Core Machine will pay for itself in any foundry that does core work. It will turn out good cores in any of the usual shapes and sizes—and only one boy is needed to operate it.

The Brown Revolving Barrel Sandblast Machine is a real money-maker because it cleans castings quickly and thoroughly—and stands the wear and tear of severe service. It can be loaded quickly, and discharges automatically into a tote box or wheelbarrow. Saves time in handling—uses minimum of sand and power—cleans the castings without breakage.

If you want to know more about these three money-makers, write

Brown Specialty Machinery Co.
2514 W. 48th Place - - - Chicago

Standard Mill

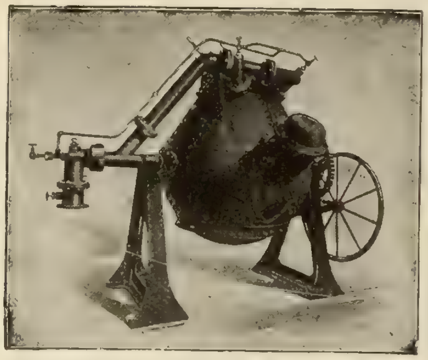


It reclaims all metal in cinders, slag, skimmings, old crucibles, etc. Built in four different sizes. Will crush and pulverize 600 to 6,000 lbs. **per hour** requiring 2½ to 7½ H.P. circulating same water over and over.

The Standard Mill is ready to operate as soon as you uncrate it. Pits under floor or special foundations are **not** needed. Lists of Canadian Foundries using it with great profit may be obtained for the asking. Write for Catalogue "C."

The Standard Equipment Company

Manufacturers of
Special Foundry Machinery
New Haven, Conn., U.S.A.



The Hawley-Schwartz Furnace

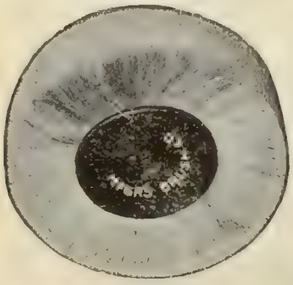
The Only Perfect Melter

All metal from 50 lbs. to 10,000 lbs.

Is Absolutely Uniform

Write for catalog and complete information

The Hawley Down Draft Furnace Co.
Easton, Penn., U.S.A.

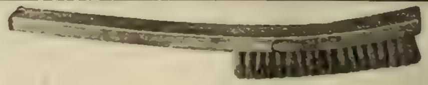


Floor Brush.

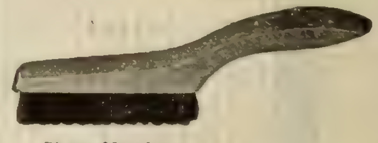
Highest Quality Foundry Brushes

We can meet every foundry brush requirement on the shortest notice. You can rely upon our lines to give the best of satisfaction from every point of view. Get your next supply from us—or give us a trial order.

The Manufacturers Brush Co.
CLEVELAND - OHIO
19 Warren St., New York



Bent Handle Washout.



Shoe Handle Washout.

Stone Brush.

"702"
Ceylon
Plumbago

Rillton
Ingot Mold
Blacking

Peerless
Perfect
Parting
Compound

ESSO

TRADE MARK REGISTERED

Rillton
Brass
Cleaner

Esso
Plumbago
Core Wash

No. 702 Pure Ceylon Plumbago
Rillton Sea Coal Facing
"Kantbebeat" Core Compound
"Bull Dog" Core Wash
"Esso" Linseed Core Oil

"All These Brands stand for Efficiency and Reliability"

Bull Dog
Core Wash

Car Wheel
Core
Compound

EVERYTHING YOU NEED IN YOUR FOUNDRY.

The S. Obermayer Company

Esso Cream
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XX
Peerless
Core
Oil

Rillton
Sea
Coal
Facing

If any advertisement interests you, tear it out now and place with letters to be answered.

Just where do we stand?

CANADIANS are beginning to wonder where we stand with reference to our place in the Empire after the war. Are we to rank as full partners in this grand, big, going concern? Are we to pay our share of the upkeep of the navy? If not, what is to be our status?

Recognizing the growing interest in this problem, the editors of MACLEAN'S decided to devote the July issue to Imperial topics. It offers articles on various phases of our Imperial problem—articles which will have a particular interest at this time when Sir Robert Borden is in London in consultation with the leaders of the Imperial Government.

The July issue contains, besides, a cluster of other big features—readable, fearless and strong. Here are a few of the best:

Field-Marshal Sir Douglas Haig.

Imperial Topics	"Pocketing Our Imperial Pride"	By H. G. Wells
	"Canada's New Place in the Empire"	By Prof. P. M. Kennedy
	"Living Up to Our Reputation"	By Agnes C. Laut
The War - -	"Your Old Uncle Sam is Coming Right Back of You"	By Lieut.-Col. J. B. Maclean
	"Stemming the Teuton Tide"	By Geo. Pearson
Fiction - - -	"The Strange Adventure of the Open Door"	By Arthur Stringer
	"The Three Sapphires"	By W. A. Fraser
	"The Torby Tragedy"	By A. C. Allenson
	"The Magic Makers"	By Alan Sullivan
	"Lennix Ballister—Diplomat"	By Archie P. McKishnie

All the regular features as well—Review of Reviews, The Best Books, The Business Outlook, The Investment Situation, Women and Their Work.

July MacLean's

"Canada's National Magazine"

At All News Stands - 20 Cents

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In
Brass
Bronze
Copper
Nickel
Tin & Zinc

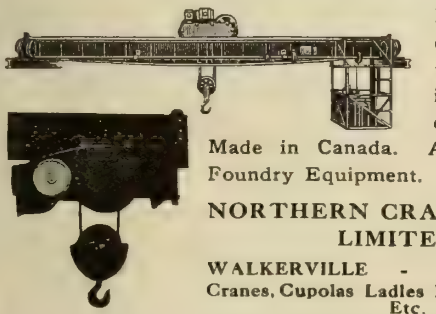
Any style or shape
Quality Guaranteed

Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

CRANES



Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS
LIMITED
WALKERVILLE - - ONTARIO
Cranes, Cupolas Ladles Hoists, Tumblers Etc.

GLOBE

Shot Blasting
Instead of Sand Blasting
Ensures 100%
Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

GET OUR SERVICE
INTO YOUR SYSTEM

Specialists in analyzing, mixing and melting of Semi-Steel, Grey and Malleable Irons.

The Toronto Testing Laboratory, Limited
160 Bay Street, Toronto

Trade Mark
Reg. U.S. Pat. Office

ANGULAR GRIT---THE SCIENTIFIC METALLIC BLASTING ABRASIVE

that reduces sand blast costs and conserves labor. ONE TON of ANGULAR GRIT will do as much work as carloads of sand; its sharp cutting points makes it superior to all other abrasives. Write for samples.

PITTSBURGH CRUSHED STEEL CO., Sole Manufacturers
PITTSBURGH, Pa., U.S.A., Established 1888
Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal, Canada.

Trade Mark
Reg. U.S. Pat. Office

Many of our customers are graduates from the school of "Just as Good as." They will never go back. In Crucibles the Best is Economy.

McCullough-Dalzell Crucibles
FORTY YEARS' LEADERSHIP
McCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

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Hamilton Facing Mill Co., Hamilton, Ont.
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Obermayer Co., S., Chicago, Ill.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Fairbanks-Morse Co., Montreal, Que.
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W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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CASTINGS, NICKEL
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United Brass & Lead, Ltd., Toronto, Ont.
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CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.

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Fanner Mfg. Co., Cleveland, Ohio.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
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Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
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Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

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Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
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Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
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Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

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Obermayer Co., S., Chicago, Ill.
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McCullough-Dalzell Crucible Co., Pittsburgh, Pa
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GRAPHITE, ANTI-FLUX BRAZING

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GRINDERS

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Can. Ingersoll-Rand Co., Montreal, Que.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

GRINDERS, RESIN

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Whiting Foundry Equipment Co., Harvey, Ill.
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Tabor Mfg. Co., Philadelphia.
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MOLDING SAND—SEE SAND

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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., New York, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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New Haven Sand Blast Co., New Haven, Conn.
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Stevens, Frederic B., Detroit, Mich.
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Harrison Supply Co., Boston, Mass.
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Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

SAND SIFTERS

Battle Creek Sand Sifter Co., Battle Creek, Mich.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SEPARATORS

Ding's Magnetic Separator Co., Milwaukee, Wis.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

SHOT

Globe Steel Co., Mansfield, Ohio.
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
U. S. Silica Co., Chicago, Ill.

SIEVES

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SILICA WASH

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SILICA ROCK, GROUND AND PULVERIZED

Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SKIMMERS, GRAPHITE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

SMALL ANGLES

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SPELTER BOWLS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

SPRUE CUTTERS

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES

Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZERS, POWER AND HAND

Can. Hanson & Van Winkle Co., Toronto, Ont.
Davenport Mach. & Fdry. Co., Davenport, Ia.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

STEEL, CRUSHED

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL GRIT

Can. Hanson & Van Winkle Co., Toronto, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

STEEL RAILS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

STEEL BARS, ALL KINDS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

STIRRERS, GRAPHITE

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

STONES, RUBBING AND OIL

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont
Can. Hart Wheels, Hamilton, Ont.

TALC

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
E. J. Woodison Co., Toronto.
Woodison, E. J., Co., Toronto, Ont.

TESTS OF MATERIALS

Hersey Co., Ltd., Milton, Montreal, Que.

TEEMING CRUCIBLES AND FUNNELS

Can. Hanson & Van Winkle Co., Toronto, Ont.
McCulloch-Dalzell Crucible Company, Pittsburg,

TRACK, OVERHEAD TROLLEYS AND TROLLEY SYSTEMS

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

TRIPOLI

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

TRUCKS, DRYER AND FACTORY

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

TURNTABLES

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

VENT WAX

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

VIBRATORS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

WALL CHANNELS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, GRINDING

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, POLISHING, ABRASIVE

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

WIRE WHEELS

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

WIRE, WIRE RODS AND NAILS

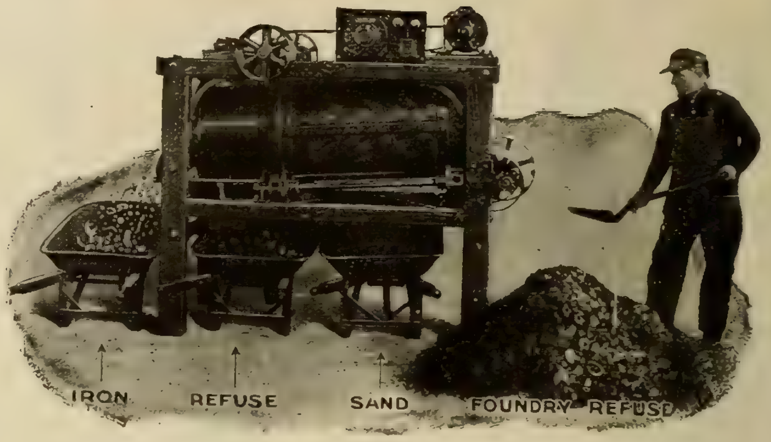
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

Let This Machine Tackle Your Refuse Pile

Feed your foundry refuse to

DINGS Magnetic Separator

and you will reclaim hundreds of dollars' worth of valuable iron and save the sand for further use.



Dings' Magnetic Separator will handle anything a shovel can lift—it won't clog on the large pieces of metal. All iron is dislodged from the magnets without the aid of belts, scrapers, or any other device.

Let us put the Dings to work at dollar saving for you. The sooner you act the more it will save.

Over 2,500 Machines Now in Use.

Write for full particulars and our catalog.

Dings Magnetic Separator Co.,
800 Smith Street, - - - Milwaukee, Wis.

GRIMES ROLL OVER MOLDING MACHINES

The Most Convenient and Most Efficient Molding Machine on the Market.

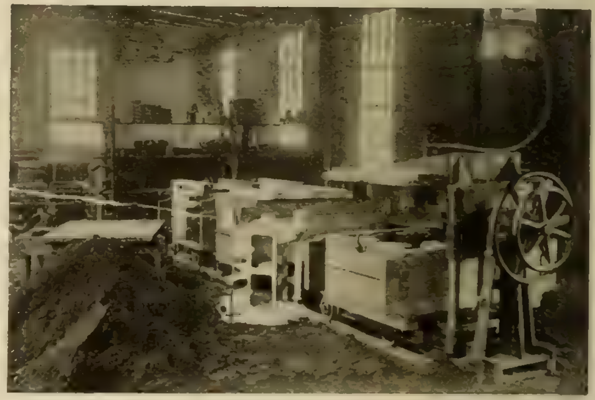
Built on the principle that the Centre of Gravity is the Centre of Rotation—it is perfectly balanced and the largest flask can be easily and smoothly turned by one man.

Requires less than half the number of steps necessary with rockover machines, and consequently saves much time.

For continuous and economical work you cannot find a more efficient molding machine.

Write to-day for descriptive catalog.

MIDLAND MACHINE COMPANY
811 W. Jefferson Ave., Detroit, Mich.



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Fire Brick and Cupola Block Headquarters

Fire Brick are not to be bought as you would buy Eggs or Oats.

To economically and successfully use them they must first be bought with knowledge of their QUALITIES as well as with knowledge of their REQUIREMENTS when in actual service.

Every brand of Fire Brick is thus made for a SPECIFIC PURPOSE.

One brand, for boiler settings, for hand-fired horizontal boilers, which resists 2,000 degrees Fahrenheit and which must resist also the abrasion wear of the slicing-bar of the fireman when he knocks off clinkers. When the wrong kind is used not only the clinker but the brick too are destroyed—there is needless expense.

Another kind, for heat-treating furnace lining where high degrees of heat prevail.

Still another kind for cupola linings, which must resist not only heat but abrasion wear of the charge as it wears down through the melting process.

So it goes; each for its purpose. This is not an intelligence office but intelligence is used in supplying the right Fire Brick for the right purpose.

I have the brands that have made Fire Brick history.

I carry these brands IN STOCK. Note the advantages: Every Brick reaches the user with clean, straight edges, uninjured, and every one is thus adaptable to a straight line of masonry in the brick wall. Again, many Fire Brick manufacturers are several months behind orders. I can accept your order IMMEDIATELY and deliver with reasonable promptness.

There is no duty on ordinary Fire Brick. I can ship Fire Brick, Cupola Blocks and Fire Clay in carlots or less. Write stating the service required.

FREDERIC B. STEVENS

Manufacturer of Foundry and Electro-Plating Supplies and Equipment.

DETROIT, MICH.

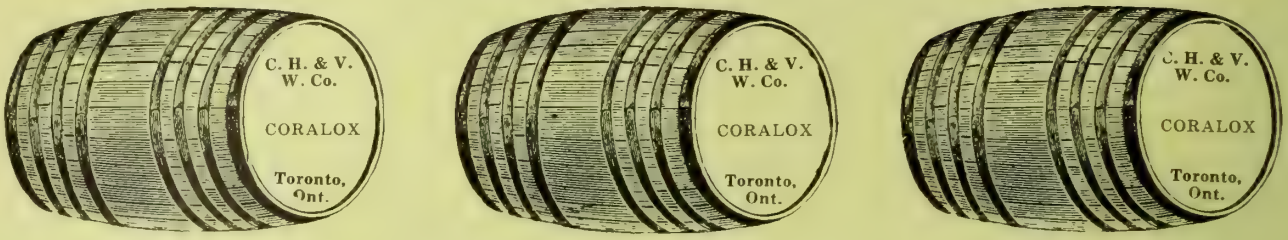
WAREHOUSE and OFFICE
Cor. of Larned and
Third St.

FACING MILL
Cor. of Isabella Ave. and
Mich. Central Railroad.

EXPORT WAREHOUSE
Windsor, Ont.

EASTERN SELLING AGENTS
Standard Machinery & Supplies, Ltd.
Montreal, Quebec.

Coralox Emery


C. H. & V. W. Co.
CORALOX
Toronto, Ont.
C. H. & V. W. Co.
CORALOX
Toronto, Ont.
C. H. & V. W. Co.
CORALOX
Toronto, Ont.

Coralox is the highest grade abrasive known.

Coralox is made from pure Corundum electrically heat treated.

Coralox is not alone harder than any natural abrasive, but of a distinctive "temper" rendering it peculiarly adaptable to polishing all metals.

We carry large stock of Coralox in warehouse, Toronto, and are prepared to make prompt deliveries from this point.

If you are not already using Coralox, write us for sample to-day.

CANADIAN HANSON & VAN WINKLE CO., LTD.

TORONTO, CANADA

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. IX. PUBLICATION OFFICE, TORONTO, AUGUST, 1918 No. 8

SILICA **Crushed Rock**
Best and Toughest for Ferro Silicon

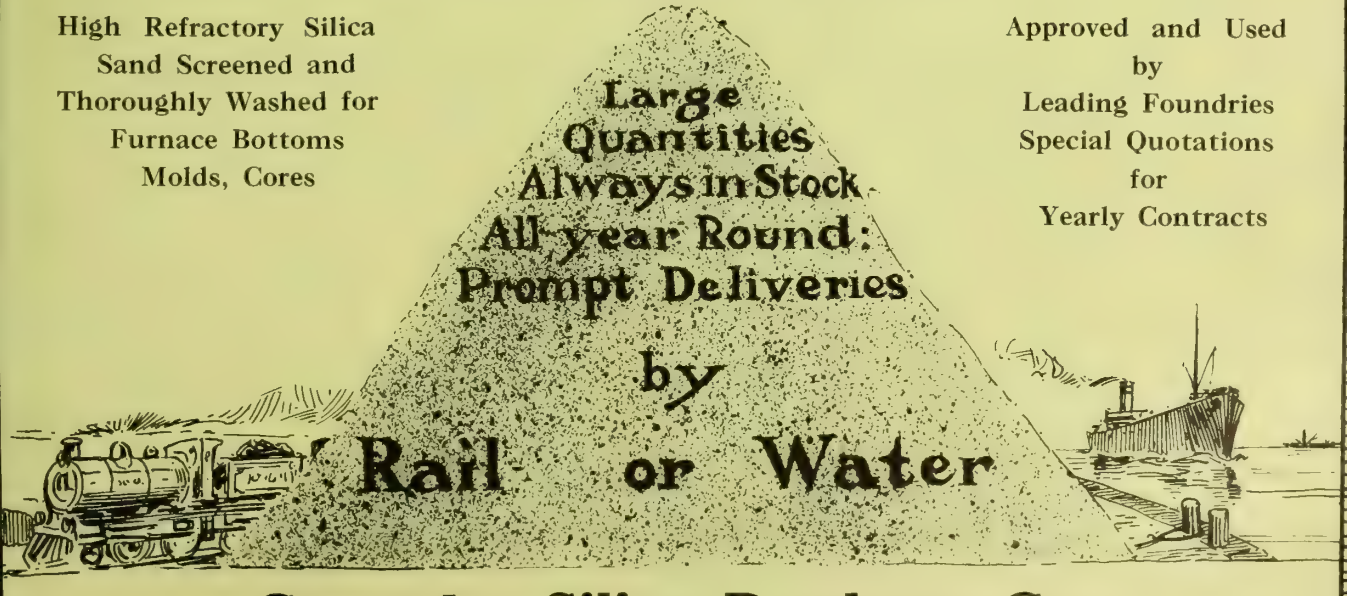
Sand For Foundry Purposes

Flour For Foundry Facing and Ceramic

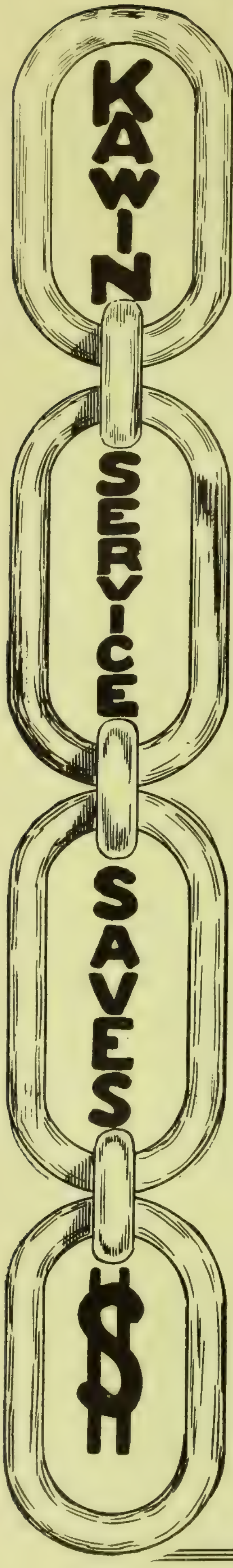
"Patronize Home Industries and Keep Money in Canada for Next Victory Loan"

High Refractory Silica Sand Screened and Thoroughly Washed for Furnace Bottoms Molds, Cores

Approved and Used by Leading Foundries Special Quotations for Yearly Contracts



Cascades Silica Products Co.
103 St. Francois Xavier St.,
Montreal, P. Q.



Link Up With
KAWIN
and Save Money

Saving money in war time is a necessity of first importance, especially in the matter of production. We are just as certain of our ability to show you many ways of saving money in your foundry practice as we have done in hundreds of other cases.

Linking up with Kawin Service means the co-operation of Foundry Specialists—men of wide experience and experts in their line, men who have the ability to successfully dispose of any problem of your Foundry practice.

Kawin Service saves far in excess of its charges by

> **Furnishing specifications for the purchase of most desirable raw materials; by advice on the proper mixture of castings; by analysis of your products at frequent intervals; by putting you in closer touch with the machine shop; by saving you money on your cupola practice; and by solving the practical difficulties in your foundry.**

Foundry materials are becoming more and more difficult to procure, and it behooves every foundry man to utilize his materials to the fullest and best advantage. Link up with Kawin Service and you will get results.

Let us explain our Service more fully. Enquiries answered without incurring any obligation.

Charles C. KAWIN Company, Ltd.

CHEMISTS FOUNDRY ENGINEERS METALLURGISTS

307 Kent Bldg., Toronto, Can. 94 Dun Bldg., Buffalo, N.Y.
Chicago, Ill. Dayton, Ohio San Francisco, Cal.

LET US SELL YOU A

DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it—you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES
don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

THE E. J. WOODISON COMPANY, TORONTO

Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont.

The Publisher's Page

TORONTO AUGUST, 1918

The Wisdom of Advertising When Oversold

ASK the "man in the street" to call the roll of talking-machine manufacturers, and he will name three almost certainly, four probably, and perhaps will go as far as five or six before his knowledge of the subject is exhausted. But ask him for the name of the leading concern in the industry and ninety-nine times out of one hundred you will get the same answer. The wisdom of the Victor Talking Machine Company's policy of continued advertising when the factory is oversold can be demonstrated by so simple a test as that.

Our neighbor, the *Dry Goods Economist,* points out that the talking-machine business is no longer a specialty proposition, requiring expert handling. The public at large is so thoroughly familiar with the idea of owning a machine and operating it that the department store can profitably enter the field and sell the line on a merchandise basis. And certainly there are plenty of available sources of supply. We counted the ads. of twenty-six different manufacturers in a single issue of a trade-paper, and that is by no means the complete roster. Some of them are also advertising to the consumer, others are not, yet the fact remains that the immense prosperity of the industry is attracting a multitude of concerns which intend to share it if they can. The leaders have done the pioneer work of educating the public to the talking-machine idea, and now let them look to their laurels!

The same thing has happened before in many other lines of business. We can name concerns which once were leaders, but which have gone down under the pressure of just such competition as is now threatening the talking-machine industry. Prestige meant little to them so long as they got the business; they felt that their standing was secure because the factory could not keep ahead of its orders. They regarded advertising as a useful means of getting more business, but why advertise when we don't need business?

There is little likelihood that leaders in the talking-machine industry will be deposed, for they have not advertised merely to "get business." Their advertising has represented in large part an investment in good-will—the laying up of a fund of public confidence which could be drawn upon whenever it became necessary. The wisdom of that policy will become more and more apparent as time goes on.—Printer's Ink.

Without One Cent Extra for Fuel

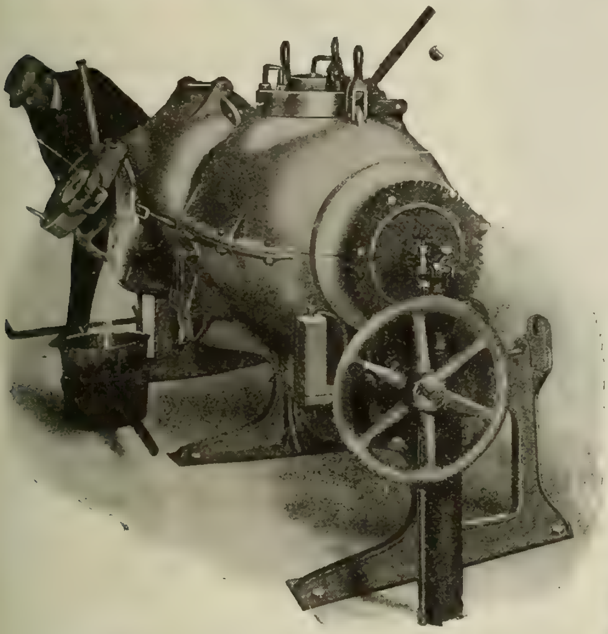
Melt Twice as Much Metal

A furnace that will melt twice as much metal without additional fuel.

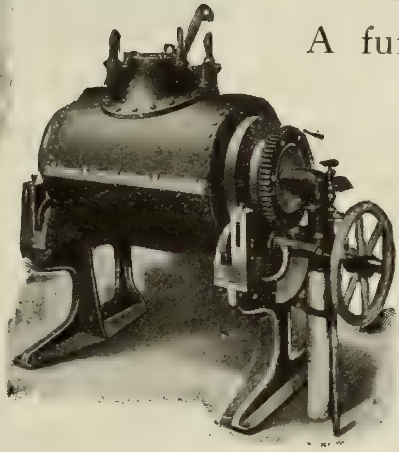
A furnace that will melt twice as much metal in the time any other furnace takes to melt half as much.

A furnace that will save so much fuel and so much time and ask nothing for upkeep, and nothing but the most ordinary care in operating.

A furnace that will do these things in the years to come as well as it is doing them now—as well as it has been doing them ever since perfected some years ago.



Monarch Double Chamber Melting Furnace

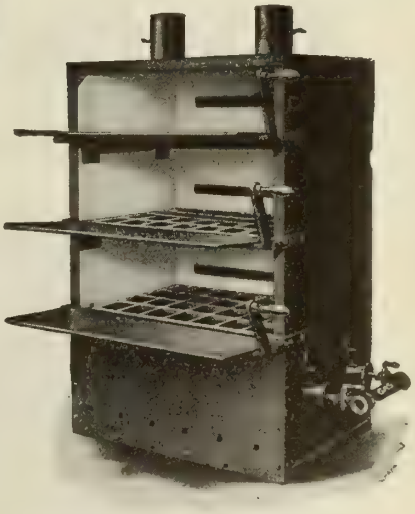


Monarch Rockwell Single Chamber Furnace—"Simplex"

Surely such a furnace merits your earnest consideration before one more week of fuel waste and time waste takes its toll from your profits. Simply say you are interested in the

MONARCH
DOUBLE CHAMBER FURNACE

We will be pleased to send you satisfactory proof that it is 50 per cent. more economical than any other furnace. We will clearly explain how it utilizes all the heat from its one burner; how it, while melting in one chamber, utilizes exhaust heat—heat that every common furnace wastes—to bring the metal in the other chamber to the melting point. We will give you complete facts and the names of users near your plant, so that you can verify every claim we make.



Monarch "ARUNDELL" Drop Front Core Oven—Any Fuel.

Monarch Metal Melting Furnaces for coal or coke, gas or oil, have no difficulty proving their superior ability. Each of our several types for small to large production is described fully in our catalogue.
Particulars of your requirements would enable us to co-operate helpfully.
Write us to-day.

The Monarch Engineering & Manufacturing Company
1206 American Bldg., Baltimore, Md., U.S.A. **Shops at Curtis Bay, Md.**

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

Your Foundry Supplies Are Lacking Without Our No. 522 Plumbago and Carbon Blacking

When you or your men are moved to profanity because of difficulty in securing smooth, clean castings, remember

Our No. 522 Plumbago and Carbon Blacking (Wet Blacking)

will solve your troubles.

A trial barrel will convince you of its superiority over other Plumbagos and Core Washes.

Carried in stock in our Montreal Warehouse.

STANDARD MACHINERY & SUPPLIES, LIMITED
MONTREAL, QUE.

THE SLY LINE

We endeavor to make every piece of equipment comprising the Sly line better than any other similar equipment. That has been our policy from the first. Time has proved how well it pays. For foundrymen individually judge our line as a whole by the service given by some one piece of Sly equipment—

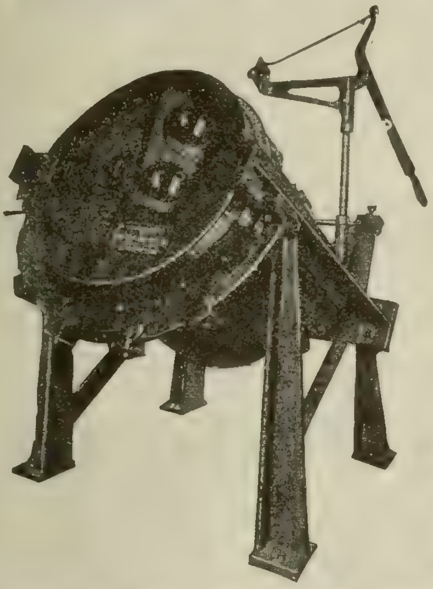
Sand Blast Mills, Rooms, Cabinets, Specialties, Rotary Tables, Pressure Machines

CORE OVENS Drawer Ovens, Rack Ovens, Car Ovens, Core Racks, Core Cars

It is human to judge all by a part, and as every single piece of Sly equipment is the best possible to build, it really works to our advantage. For instance: Many foundries—and a number of them rank with the largest—are equipped throughout with Sly Sand Blasts, Core Ovens, Core Sand Reclaimers, Dust Collecting Systems, etc. In every case some one piece of Sly equipment had inspired complete confidence.

Write for our catalog.

THE W. W. SLY MFG. CO.
New York CLEVELAND, OHIO Chicago



Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the best possible wheel for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

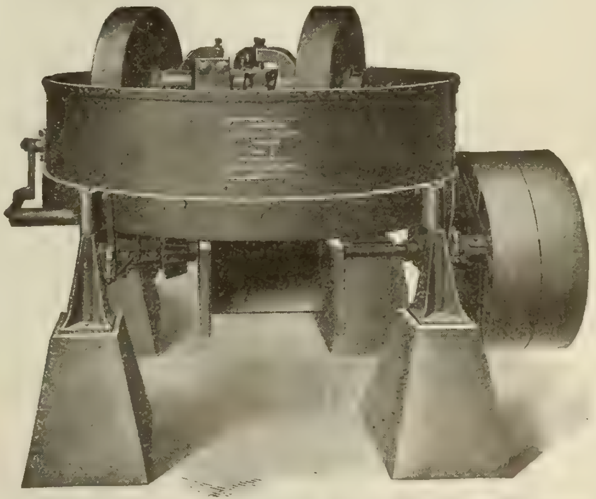
Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers of Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

A Message to Canadian Foundries
THE SIMPSON
INTENSIVE FOUNDRY MIXER
Saves Both Sand and Labor

Improves the quality of the castings.
Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.

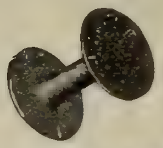


The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.

Write for details and prices to

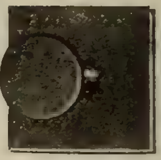
National Engineering Co.
Room 505, Tacoma Bldg.
CHICAGO, Ill.

Foundry Chaplets

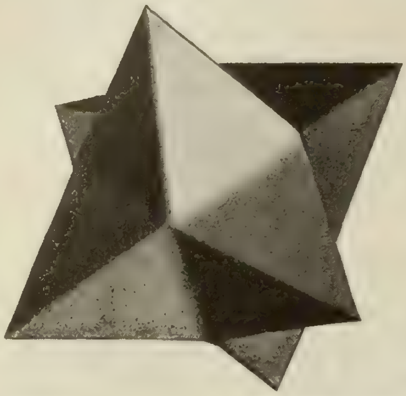


of every description

Forged, Riveted or Electric Welded



Let us prove to you the value of Fanner Quality, once tried always used.



HARD IRON TUMBLING STARS

They are sharp—They will last.

Your inquiries always invited.

THE FANNER MANFG. CO.

CLEVELAND, OHIO

Mark Inquiries Dept. C.

English Moulding Machines

"Jarr" Ramming
"Head" Ramming
"Hand" Ramming

The most efficient on the market.
Well built to suit rough usage.

Write for particulars to the makers.

Britannia Foundry Company

Coventry, England

Help Win the War

Your Government Needs You

Show the Allied Foundrymen that AMERICA leads the world in SEMI-STEEL as well as in iron and steel.

Reprint from IRON TRADE REVIEW---June 27 issue

Adopt Semi-Steel Shells

A development of great importance taken in connection with the announcement of the gigantic ordnance program of the government is the decision to adopt the use of cast semi-steel shells on a large scale. The orders in prospect will call for 12,000,000 projectiles of 6 to 8-inch caliber. This will require approximately 1,200,000 tons of foundry iron and scrap. Specifications covering these semi-steel shells have been approved and announced by the ordnance department. These orders will materially enlarge the field of war work for the foundry industry. The government also has distributed among various steel foundries heavy orders for cast steel shell blanks aggregating 80,000 to 85,000 tons. At the same time, additional distribution of 135,000 to 140,000 tons of shell rounds among various mills is announced.

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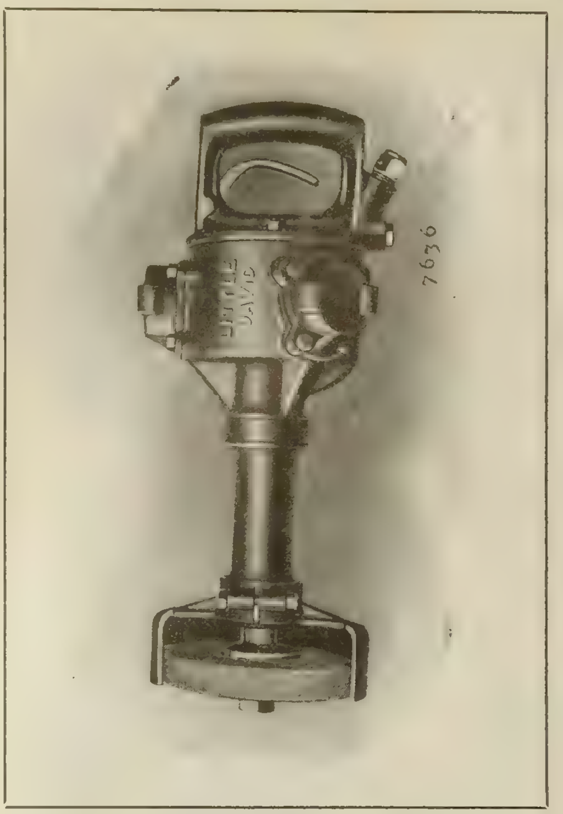

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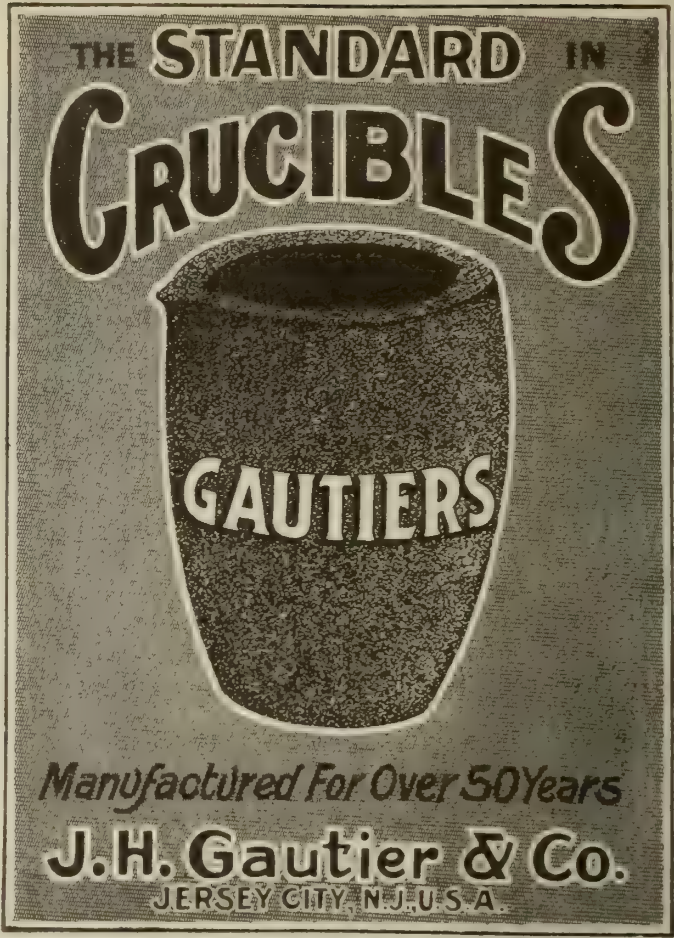

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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Canadian National Steel Plant

By W. F. Sutherland†

GROUP OF BUILDINGS AT ENTRANCE TO PLANT.

THE industrial activities of the last few years have brought about far-reaching advances in almost every line of endeavor. This is particularly true in the metallurgy of iron and steel. The electric furnace is playing an important role in this advance and its development to the point where it can be depended upon for the quantity production of high grade steel such as is required in the government specifications for shell and other munitions of war is of much interest.

The metallurgical processes connected with the refining of steel are now well established and the ability to meet the requirements of quantity production and quality combined with the ease with which scrap steel can be used as the raw material make this process admirable from many points of view. In the open hearth furnace the ratio of scrap to pig iron charged may be as high as 75 per cent. but in the electric furnace it readily approaches 100 per cent. This fact, coupled with the cost of labor will undoubtedly operate to the advantage of the electric furnace after the war.

The scrap resulting from the operation of munition plants serves as an admirable source of raw material for use in the electric furnace, and this, with the adequate supply of power available determines the equipment installed in the plant operated by the Imperial Munitions Board for the British government and described below.

The preliminary work and plans were done under the direction of Col. David Carnegie by Perin and Marshal of New York, and the construction work was let to Roger Mills and Sons of Toronto. The engineering since required has been entirely in the hands of the staff of engineers which forms a permanent part of the organization.

Plant Layout

This plant, believed to be the largest electric steel plant yet constructed, is admirably planned with ample facilities for the economical handling of all materials. Standard gauge railroad tracks, about five miles in all provide and serve every individual unit of the plant, in many cases permitting the loading and unloading of the cars under cover.

The various functions of the plant naturally center around the electric furnaces and a major portion of the trackage and equipment has to do with the handling of the raw material, steel turnings. Much of this material is stored in open stock piles in the plant yards and is handled by locomotive cranes equipped with electro-magnets. The remainder is stored under cover in a covered stock pile adjacent to the main furnace plant. This building has a capacity of about 12,000 tons of turnings and is equipped with two ten-ton Northern travelling cranes with 55-in. electro-magnets.

Bays project from the main charging floor out over the stock pile at each furnace, and the 24-in. gauge tilting scrap cars serving the furnaces are loaded by crane, pass to the weighing scales and are then dumped at a point between the furnaces convenient for their hand charging.

As may be noticed in the accompanying cross-section the layout affords ex-

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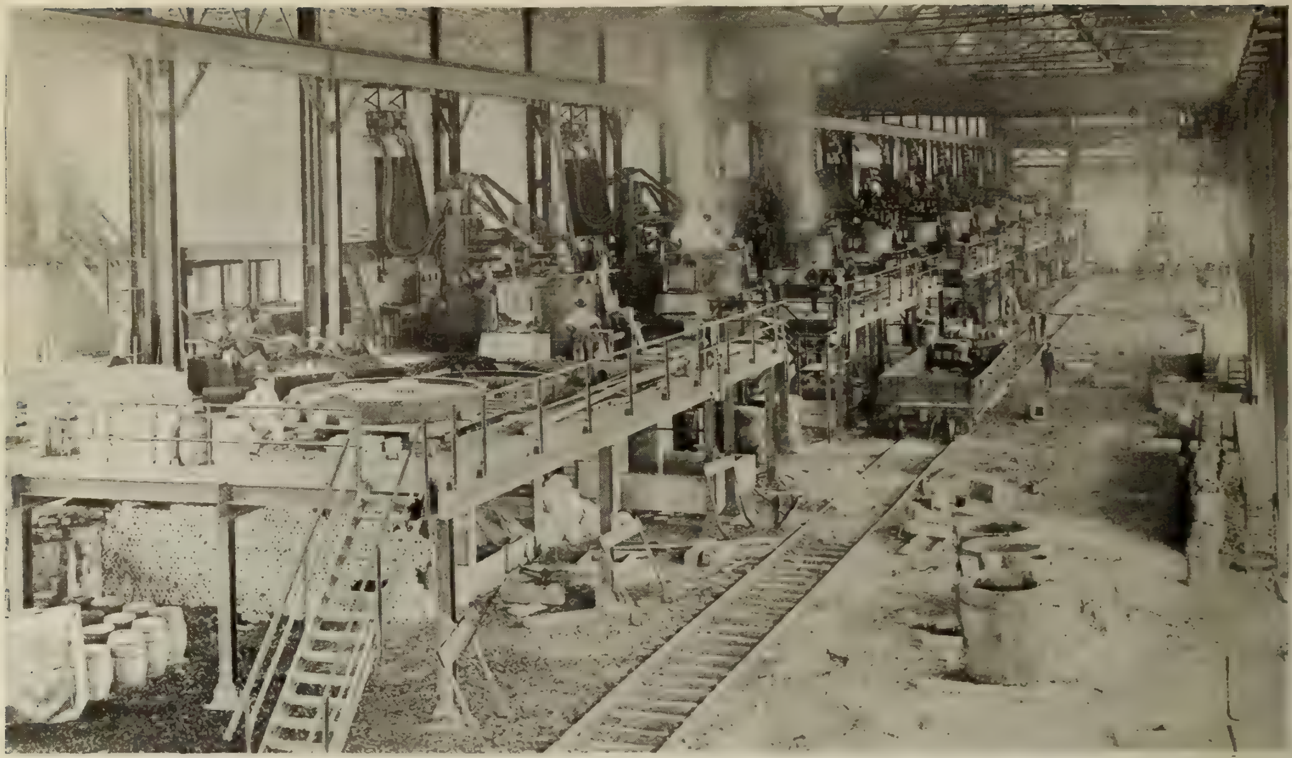
†Associate Editor, Canadian Foundryman.



GENERAL VIEW OF MELTING HOUSE SHOWING ARRANGEMENT OF FURNACES, CHARGING AND CASTING FLOORS. A FURNACE TOP IS BEING RELINED AT THE LEFT HAND FOREGROUND.

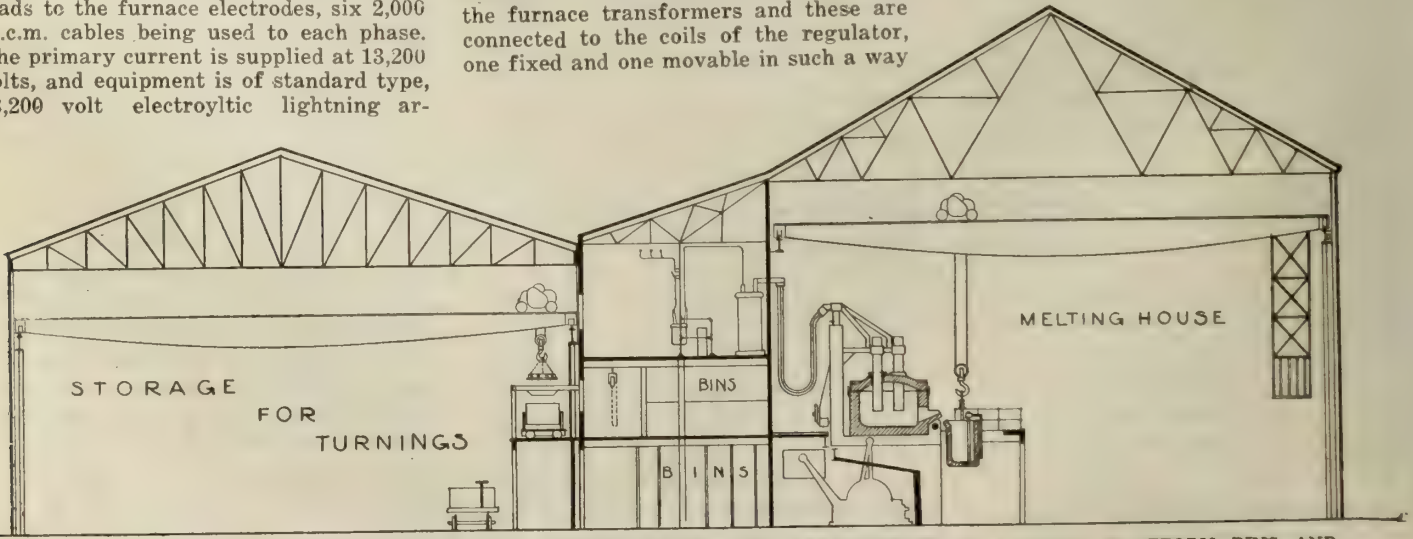
cellent storage space in the lean-to on both the charging and casting floors. This space accomodates the ferro-olloys and fluxing materials used in the various slagging operations. The building in which the ten electric furnaces are installed is 610 ft. long, 75 ft. span, and is of standard mill construction. As above-mentioned the transformers and stock bins are housed in a lean-to 25 ft. wide which runs the full length of the building.

The transformer room is enclosed in hollow tile and is raised above the furnace-charging floor, thus permitting the bins for storing the various materials used in refining to be placed directly underneath and convenient to the furnaces. The three-phase 1,500 kv.-a transformers are located directly behind the furnaces which they serve, permitting a direct connection through flexible leads to the furnace electrodes, six 2,000 m.c.m. cables being used to each phase. The primary current is supplied at 13,200 volts, and equipment is of standard type, 13,200 volt electroyltic lightning arrestors and 30,000 volt oil switches being installed.

Thury Regulators

The Thury regulators common to this type of furnace are mounted in the transformer room while the indicating instruments and winch operating controllers are mounted behind the furnaces which they serve. This regulating equipment supplied by the Westinghouse Company provides automatic regulation of the current supplied to the furnaces and produces a uniformly constant current at the electrodes subject to control by the operator in charge.

The furnace electrodes are raised and lowered by means of a motor-operated hoisting mechanism or winch, the motors in turn being controlled by means of the regulator. Current transformers are installed in the high-tension circuit of the furnace transformers and these are connected to the coils of the regulator, one fixed and one movable in such a way that when the furnace current is at its proper value the movable coil is held in equilibrium by a spring. When the current rises above or falls below its normal value this equilibrium is destroyed and the coil and the rocking lever to which it is attached are swung one way or the other and thus engage tappets and in turn release pawls which fall into notches in the rim of a tappet wheel which is given a reciprocating motion about its centre. These pawls are located upon a rocker arm which makes contact with either one of two sets of carbon contacts and according as one set or the other of these contacts is made, the winch motor is operated in one direction or the other, thus raising or lowering the electrodes. A rheostat is provided in the current transformer circuit which shunts a portion of the current and provides a means



CROSS SECTION OF TURNINGS STORAGE AND MELTING HOUSE. THE ARRANGEMENT OF LOADING PLATFORM BINS AND TRANSFORMER ROOM IS CLEARLY VISIBLE.

FURNACE TILTED AT THE FINISH OF THE MELT AND STEEL BEING TEEMED INTO LADLE.

of maintaining any constant current value desired.

In a plant of this size it is necessary to provide some means of central control from which switching operations can be carried out. This need is filled by the main control room centrally located between the two sections into which the transformer room is divided. This control room houses the main control switchboards and projects out into the furnace room giving the operators a clear view of the furnaces. The switchboards in this room carry the control and service switches and the recording and indicating meters for the plant load.

Under the main control room space has been allocated to the service equipment needed for the operation of the plant. This equipment is located on the ground or casting floor level and consists of a 60-cell storage battery for the operation of the remote controlled high-tension oil switches, 200 and 300 kw. motor generator sets for 230-volt direct current, an air compressor, oil pumps, etc.

Furnaces

Ten furnaces are installed, all of six tons capacity, and of the Heroult type. These furnaces are located on a charging floor about 12 ft. above the casting floor, the space underneath being given over to the tilting mechanism and the oil burners for pre-heating the teeming ladles. The tilting mechanism is protected from accidental breakages in the furnace lining by a brick-lined steel pan which carries any metal away and into the slag pit. Nine of the furnaces have a basic lining while the tenth is acid.

Heats are poured at short intervals, between forty and fifty being run off in the course of a twenty-four hour day, each heat taking about four hours for its completion.

The control of each melt is a matter of skill and judgment on the part of the furnace operators controlled and rigorously checked by analyses of the steel made during the melt. The laboratory in which these tests are made is housed in a separate building insuring cleanliness and the quiet conditions necessary to accurate work. A balance room is provided where all weighing necessary to the analyses is made.

The steel, when ready, is teemed into bottom-pour ladles, preheated; these in turn serve the ingot molds. The ingot molds of cast iron are of a size best adapted to the shell forging desired and the billets in the case of the 6-in. shell weigh about 200 lbs. Hot tops for the ingot molds are made in the plant, and the care taken in pouring as well as the shape of the ingot molds and hot tops insures the absence of piping except in the crop end. Before each ingot has completely solidified a metal identification tag is inserted in the crop end.

Two methods of pouring the ingots are in use. In one of these the ingot molds are stood on end in rows on the floor, while in other eighty-four of them are mounted on one truck and the truck moved instead of the crane. This results in a considerable saving of metal in the avoidance of splashing.

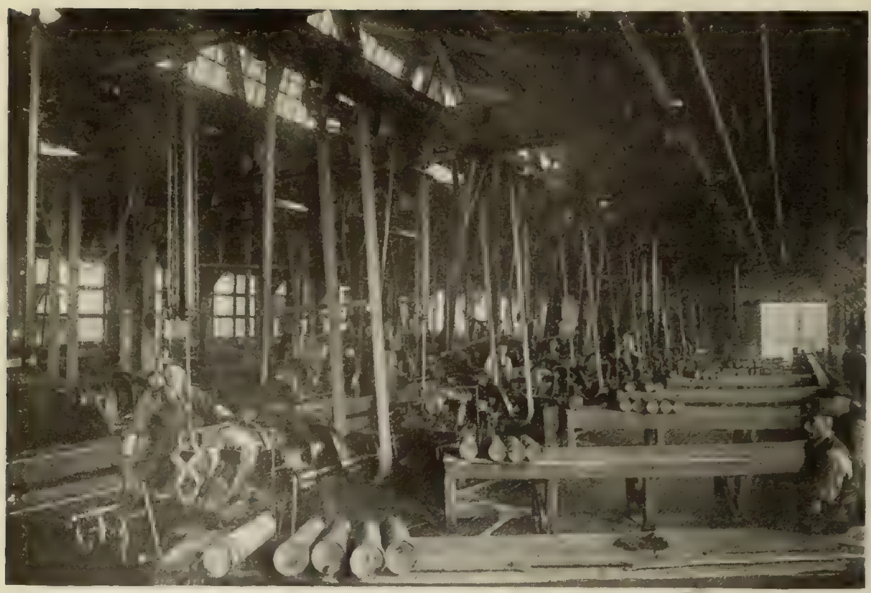
Four Northern cranes are installed in the melting house each with 15-ton main hoists, and a 10-ton auxiliary. These cranes not only serve the teeming ladles but are used for other operations, one of their principal uses being the moving of the furnace tops to a space provided at each end of the charging floor for relining.

Breaking and Cutting-Off Shop

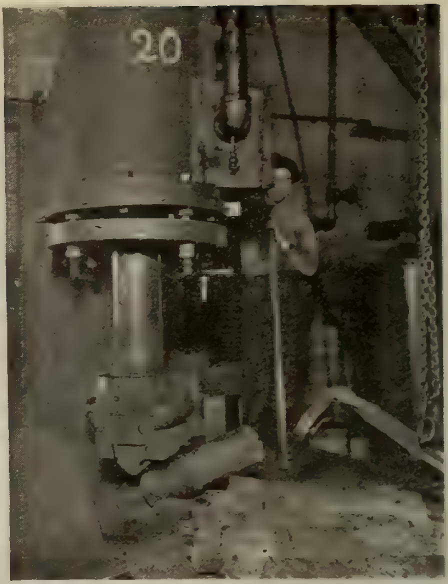
As soon as the ingots are cold they are sent to the breaking and cutting-off shop. This is in a separate building and a feature which has much to do with production first makes its appearance here. Manual labor is eliminated in all possible ways and Link Belt conveyors adapted to the needs of each operation are used throughout. The ingots are carried from the furnace room to the cutting-off shop by means of a Link Belt conveyor running between the two buildings, and are taken off the conveyor and placed on tables serving the cutting-off machines. Here they are stamped with the melt number and are then picked up and placed in the cutting-off machines, made by the Williams Tool Co. of Erie, Pa. To deal with the ingots, seventeen of these machines have been installed in two rows down the center of the shop and pneumatic hoists are provided which eliminate all manual labor.

The ingots are cut about half way through and are then transferred to another conveyor which carries them to the pneumatic hammer. This hammer breaks

SCENE IN MELTING HOUSE—POURING INGOTS.



VIEW IN CUTTING AND BREAKING SHOP SHOWING CUTTING-OFF MACHINES, MARKING TABLES AND PNEUMATIC HOISTS



BREAKING OFF THE CROP END OF THE BILLETS IN THE CUTTING AND BREAKING SHOP

off the crop end which falls to one side, down a chute, and into a conveyor, from which it eventually finds its way into the furnaces again. The shell billet rolls the other way on to another conveyor, undergoes its first inspection and is ready for forging.

One ingot in each melt is marked with a distinctive paint and drillings are made from this to determine the chemical analysis of the steel.

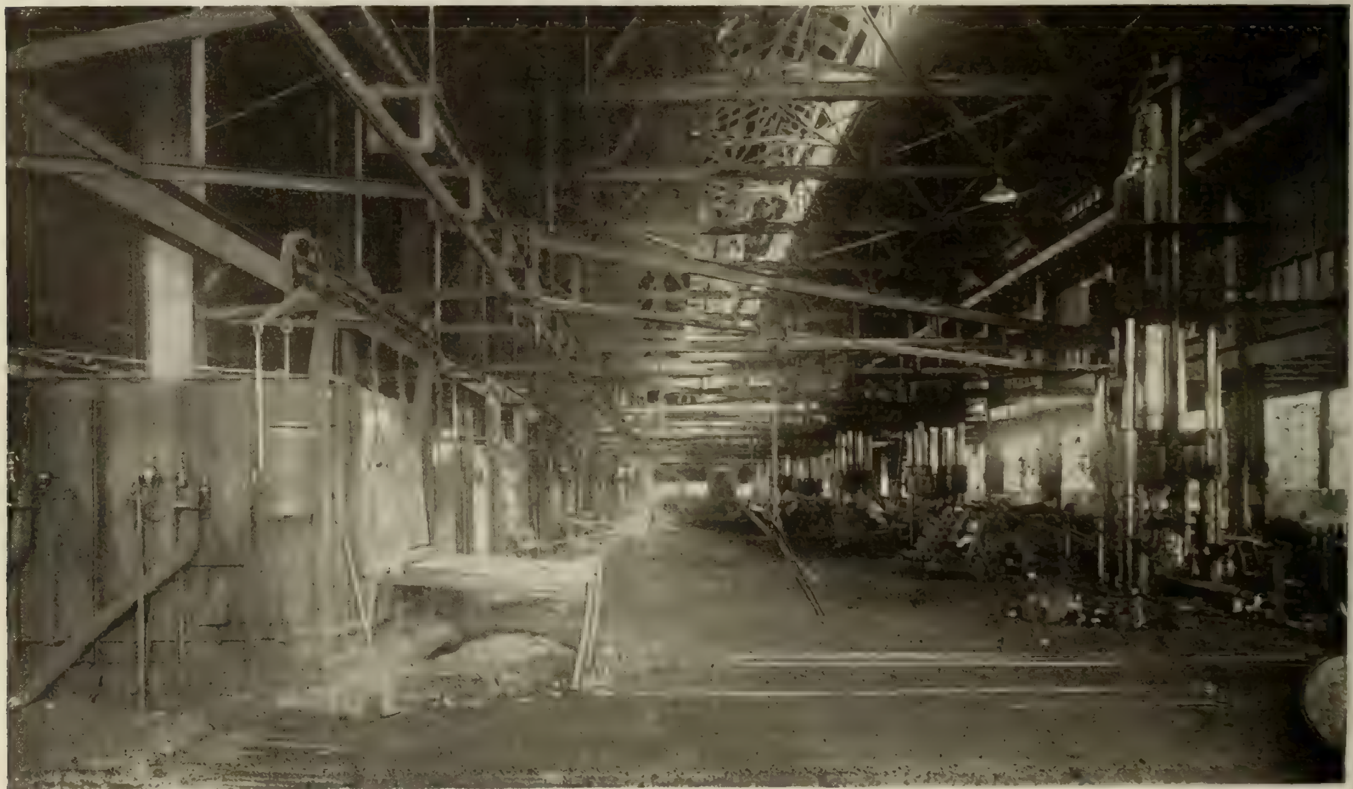
The two illustrations shown of the cutting and breaking shop give a clear idea of the layout and amount of equipment necessary.

Forge Shop

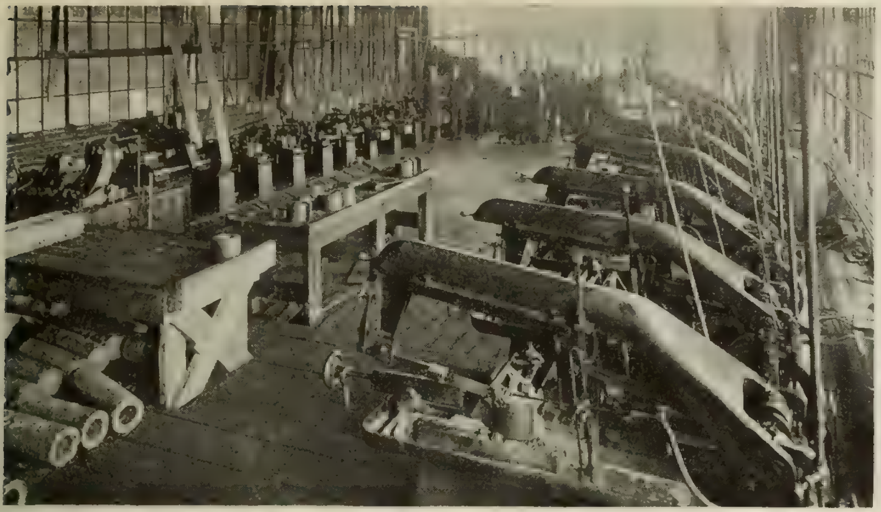
The forge shop, located adjacent to the cutting and breaking shop, is a spacious steel building admirably planned for the handling and routing of the billets through the various operations. The billets as they are received from the cutting and breaking department weigh about 158 lbs. and measure about 6½ in. average diameter. Each lot as it is received is piled back of the furnaces, care being taken throughout all the operations to keep all billets belonging to the same heat number together, and separate from other lots.

The furnaces, of which there are seven, are of the continuous type, and taking in the billets at the rear end deliver them at the proper temperature at the front. Oil firing is used, the oil pressure being about forty pounds and the air pressure ten ounces. Two underground oil tanks are provided into which the fuel is run directly from the tank cars.

The hydraulic forging presses are five in number and are all of 500-ton capacity made by the Southwark Foundry and Machine Co. A water cooling system is employed to somewhat reduce the temperature of the dies and punches, a perforated pipe surrounding the upper end of the punch. The billets, while passing through the furnaces turn and come to a uniform temperature, and on reaching the front are ready for pierc-



FORGE SHOP FURNACES AND HYDRAULIC PRESSES.



VIEW IN TEST BILLET SAW ROOM.

ing. The billet is dropped into the die and a centering ring placed on it to guide the punch. The piercing and drawing of the six-inch shell forging are done in one operation, the piercing causing an upward extension of the metal out of the die. The return stroke of the press withdraws the punch and the forging is forced up out of the die by a kicker and is removed and dropped into a conveyor for removal to the cooling beds.

The various heats are still kept separate, and when the forgings are sufficiently cooled they are again inspected, stamped with the heat number, and one or two of them picked at random and taken to the saw room.

These forgings are used for the various mechanical tests demanded by the government. The base is cut off in William's cutting-off machine similar to those in the breaking and cutting-off shop described above and test pieces are sawn out of both sides by a battery of Peerless high-speed saws made by the Peerless Machine Co., Racine., Wis. These saws cut the test piece out at one operation by means of a double saw. Following this the bases are inspected for piping or other flaws and the test pieces are turned down to the proper section for the government test.

GOTHIC STEEL. METHOD OF HANDLING THE BARS PREPARATORY TO NICKING.

Power House

The hydraulic pumping equipment necessary for the operation of a forge room of this size must necessarily be of some magnitude. This equipment is housed in a separate building and from the accompanying engraving a good idea of the layout may be gained. A battery of seven 200-gal. Dean pumps, made by the Worthington Pump Co. are installed. These pumps are geared to 200 h.p., 2,200 volt Westinghouse motors running at 500 revs. per min.

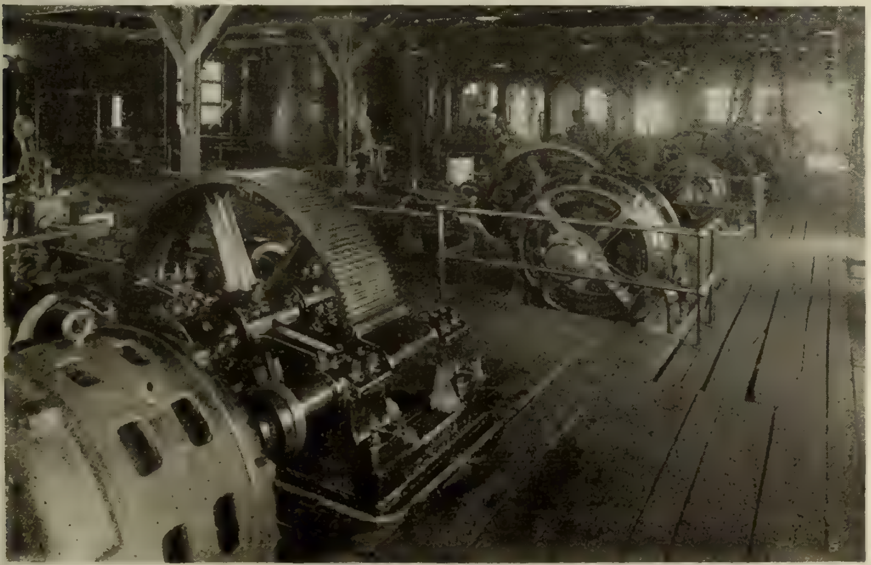
The autor starters and other switching equipment, together with the necessary switching equipment and meters, are installed on the wall adjacent to the motors which they control.

Two 28-in. accumulators of Southwark make are also installed in this building and the oil pumps for the oil-burning system are located near the oil tanks adjacent to the forge house.

Billet Plant for Gothic Steel

One of the interesting features in connection with this plant has to do with the cutting of the bars of Gothic steel into billets of the proper size for forging and the advantages of conveyors in the increasing of production and eliminating labor are nowhere better shown than here. The steel as it is received from the cars is stacked in piles according to heat number, and as required is picked up by air hoists and placed on the gravity conveyor shown in the illustration of the steel yard.

The steel travels on this conveyor to the first position in the cutting-off shop where each bar is marked from gauges to the proper length. The bars next pass on the the same conveyor to the nicking position where they are nicked to the proper depth by the oxyacetylene torch. As shown, two gangs of men work at this position and using torches and apparatus supplied by L'Air Liquide Society rapidly nick the bars on one side to the proper depth of about one half inch. The torches are provided with supporting wheels which render the operation easier to perform



VIEW OF POWER HOUSE SHOWING HYDRAULIC PUMPS AND ACCUMULATORS.

NICKING THE GOTHIC STEEL BY THE OXY-ACETYLENE TORCH.

After the nicking operation the melt number is stamped on each portion of the bar, and the bars still travelling forward are brought to the horizontal bulldozer, where they are broken into required lengths. The next operation is the inspection, one man being stationed at this point to swing the billets in such a manner that the inspectors may readily view the end again. The billets are next stamped again and pass on to the loading system.

One of the plant's many sidings is located alongside the cutting shop and the billets are loaded into the cars by means of an ingenious gravity carrier system, it being possible to load three cars simultaneously. The engraving shows this system to advantage, the tables in the foreground serving as a place to store billets while cars are being shunted. The billets, when going to the tables are carried on a continuation of the carrier from the dull-dozer, but when being loaded into cars are carried up the elevator to the distributing center where they are guided into the proper conveyor by the man stationed at this point. A removable extension of the conveyors carries the billets into the cars where they are piled for shipment.

An extremely high rate of production is maintained in this department, a rate of 10,000 per day being easily maintained. This rate is possible through the co-ordination of the working force and by means of the conveyors, which were supplied by the Canadian Matthews Gravity Carrier Co., Toronto.

Welfare

The present trend towards better working conditions, protection from industrial accidents, and a humanitarian interest in the employees' general welfare, is well illustrated in the plant under consideration.

Much can be done in the prevention of accidents by proper guarding of points of possible danger and by the provision of warning signs where necessary. One especially commendable feature in the operation of this plant is seen in the explicit instructions for starting and controlling the apparatus of the plant.

These instructions are in most cases painted in large letters on a prominent part of the motor-starting gear and leave nothing to the operator's experience and memory.

All accidents can never be eliminated and where such occur they are taken care of in the company's own hospital with its staff. A bright and airy ward is provided for the more serious cases, and a well-equipped operating room and diet kitchen form part of the hospital.

Meals are served at cost to the men and staff, and while conforming to the many food regulations at present in force these meals are both sufficient in quality and quantity to meet the demands of those engaged in strenuous labor.

The men's dining room seats 200, and the men may either sit down at a hot dinner of meat or fish with coffee, tea or milk, vegetables and dessert, or if desired may purchase at cost sandwiches and other food for consumption elsewhere. Tobacco is also sold.

The staff dining room is housed in a separate building adjacent to the general offices and in the two dining rooms accommodation is provided for about fifty meals at a time. A well appointed kitchen is provided and the meals here are also served at cost.

A fire brigade formed of certain of the men employed in the plant forms a very necessary feature for the operation of the fire fighting apparatus with which the plant is equipped.

AFTER THE GOTHIC BARS ARE NICKED BY THE OXY-ACETYLENE TORCH THEY ARE CONVEYED TO THE BULL-DOZER SHOWN AND BROKEN INTO BILLETS OF THE PROPER LENGTH.

TOOL STEELS

By L. V. R.

The enormous increase in the output of munitions has involved so large a demand for special tool steels that a concise statement of the most efficient heat treatment provides an acceptable contribution to the literature of the subject, and should be of great value to both tool makers and users. The special properties of these steels demand thermal treatment totally different from that of ordinary carbon steel, and many toolmakers have been long in realizing this, and thus obtaining the best value of the expensive constituents which impart the essential properties. In order to appreciate more fully the causes of hardness in these special tool steels—by which term is understood those steels, in which elements other than carbon have been added to impart the desirable properties—the cause of hardening and the effect of tempering on carbon steels are first outlined. In the annealed state carbon in steel exists as a definite carbide below 700 deg. C. As the temperature is raised beyond this point the independent crystals of carbide cease to exist, and the carbide is in a state of solution in the iron. It is in this condition that it imparts hardness. Quenched from this temperature the carbide is forcibly retained in this solution form which causes the hardening. A carbon steel thus hardened to its maximum degree, however, possesses a very low elastic limit, and is consequently quite brittle.

This initial brittleness is removed by tempering, which relieves the internal stresses set up in quenching. The softening caused by tempering is due to some of the carbide of iron retained in solution by quenching being again dedeposited. The amount is readily controlled by the temperature of tempering, so that any combination of properties between the extremely hard and brittle and the relatively soft annealed state can be obtained.

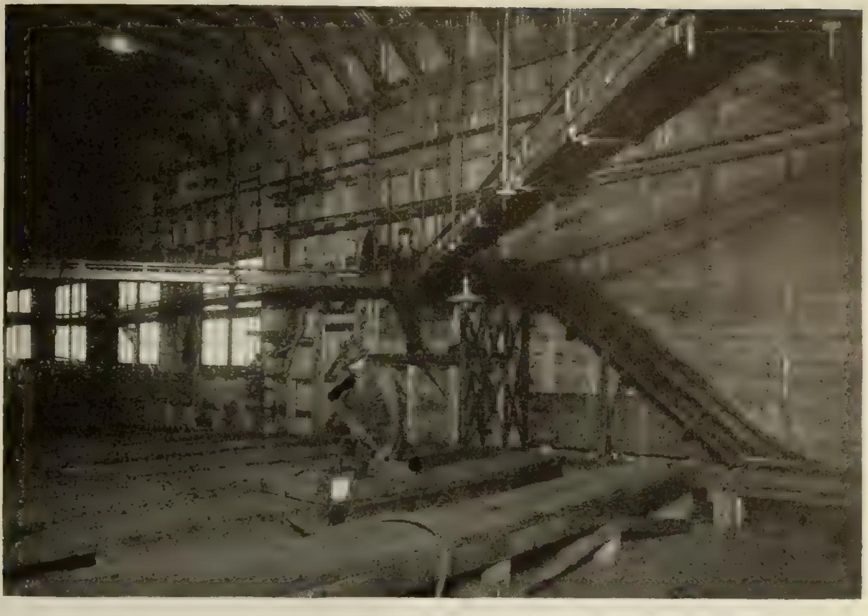
With carbon steels it is only possible to harden completely if the mass of the steel is small. Remarkable differences in properties are produced by comparatively slight differences in the rate of cooling.

With special steel however, this equivalent of quick cooling is obtained by the addition of elements such as nickel, manganese, tungsten and chromium. These lower the normal temperature of the carbide charge, the variation of temperature being such that it can be brought down to ordinary temperatures. Thus, in these steels, the properties are modified from within, and therefore practically the same quenching effects are obtained through the whole mass. The effect of rate of cooling is well illustrated in the case of chromium steel. Thus in a steel containing over 6 per cent. chromium and 63 per cent. carbon, it was found that with two lin. cube specimens, heated to 1,000 deg, C., one cooled on an asbestos pad in still air, and taking about half an hour to reach normal temperature, gave a Brinell hardness number of 642; while the second cooled slowly in the furnace over a period of one hour, gave a hardness value of only 281 on the same scale.

Importance of Temperature

With tungsten steels the hardening temperature is of the utmost importance. Broadly speaking, this should be practically as high as possible, short of actually melting the metal. Thus if air-hardened from 1,050 deg. C., the steel loses its hardness more quickly than if hardened from, say, 1,250 deg. C., and, further, it does not show anything like the same degree of secondary hardening. The reason for this is that the tungsten present does not go completely into solution until a temperature of the order of 1,250 deg. C., is reached. Further, the hardness thus acquired is retained through reheating up to 500 deg. C., but in addition, by increasing the secondary heating to 600 deg. C., a marked increase in the hardness takes place, and reaches a value in excess of that obtained when first hardened.

Finally, the addition of chromium to the composition usual for high speed cutting steel—for example, 18 per cent. tungston, 6 per cent. chromium, and 63 per cent. carbon—induces considerable hardness in the air hardened state, but this markedly falls off as reheating to 500 deg. C., takes place, while at 600 deg. C., a substantial secondary hardening takes place which makes the material much harder than initially air-hardened. These facts are of great importance, and indicate the desirable heat-treatment of tools before putting into use. This essential secondary hardness can be effected by either (1) air hardening and reheating to the necessary temperatures, or (2) quenching from the hardening temperature in a suitable bath of molten lead or suitable liquid which is kept at the correct temperature. The suggestion of some workers that this secondary treatment is not necesary in order to obtain the best cutting speeds, and that the same effects can be obtained by using the air-hardened tool and slowly increasing the cutting speed to the maximum, is, in a limited sense, true, the frictional heat of the work done subjecting the tool to the secondary temperature; but this treatment involves undue wear of the tool, as it passes through a relatively soft condition.



GRAVITY CARRIER USED IN DISTRIBUTING BILLETS TO FREIGHT CARS.

WORKS ACCIDENTS, THEIR CAUSES AND REMEDIES

By M. A. R.

An investibation of the factors concerned in the causation of industrial accidents has recently been conducted by Dr. H. H. Vernon on behalf of the Health of Munition Workers' Committee, and the results are now available. Data relating to upwards of 30,000 accidents were collected at four factories during periods ranging from nine months to over forty years. Some interesting conclusions are drawn and various suggestions are made for lessening the risks to which factory workers are exposed.

While speed of production is an extremely important factor, Dr. Vernon says that accidents are very largely due to carelessness and inattention, and could be diminished by preventing the workers from talking to one another. At all the factories the night shift workers suffered fewer accidents than those on the day shift. This was due, not to the smaller output but the calmer mental state of the night workers.

These workers have for the most part forgotten the excitement and pleasures indulged in shortly before coming on to night shift, and they have nothing but an unexhilarating breakfast and bed to look forward to. Such a mental state is impossible of achievement by the day shift workers, but something in the way of mental calm and equilibrium can be attained by stopping all conversation excepting that relating to the work in hand. If the workers would consent it would be a good plant to induce temporary deafness by plugging the ears and so shut out the noise of the machinery, which is in itself an important cause of distraction and fatigue. Again, if it were practical it would be of value to shut out the sight of surrounding objects by separating the lathes or other machines from one another by partitions.

Hours Influence Fatigue

It is pointed out that the production of excessive fatigue, with its accompanying increase of accidents, can be almost entirely avoided by choosing suitable hours of labor. It can also be combated by the introduction of seats for the standing workers to rest on occasionally when they are not actually working, and of the most suitable seats possible for sedentary workers. The influence of fatigue on accidents to women was strikingly shown at a fuse factory, when the operatives were working a twelve-hour day, or seventy-five hours a week. The women's accidents were 2½ times more numerous than in the subsequent ten-hour day period, but the men's accidents showed no difference. Also the women were treated for faintness nine times more frequently than the men, and were given sal-volatile twenty-three times more frequently, whereas in the subsequent ten-hour day period they were treated for faintness and given sal-volatile only three times more frequently.

It was found that women suffered twice as frequently as the men from sprains, and were especially liable to wrist sprains at the fuse factory, as they had not sufficient strength to push home the clamping lever of the lathes. The women at the shell factories suffered nearly four times more burns that the men, chiefly from hot metal turnings. Hence the sprains could be reduced by alterations of machinery and the burns by protecting the hands.

Much Depends on Securing Suitable Sand

Cascades Silica Products Co., of Montreal, Have in Operation an Extensive Plant For Securing Unlimited Supply—Quartz and Sandstone the Basic Materials

FOUNDRY efficiency, particularly in regard to the quality of the finished product, is influenced to a great extent by the sand that is used for the preparation of the moulds in which the product is made. In common with all other industries the foundry trade has been seriously affected by the difficulties contingent to the delivery of equipment and other necessary supplies. The obtaining of suitable sand has always been a serious problem for foundry officials, increasingly emphasized during the past few years, owing to the obstacles placed in the way of importing sand from foreign countries. Difficulties surrounding the shipments from the States frequently placed Canadian manufacturers in a very tight corner, the consequence being that greater interest has been displayed, by Dominion Government officials, respecting the sand deposits in this country, with the result that considerable investigation has already been made, and greater progress is anticipated, in developing those latent resources that will eventually place Canada in a more independent position as to the acquisition of material heretofore obtained, largely, from other sources.

FACE OF SILICA ROCK QUARRY.

Pioneer Work

During the past four years the Department of Mines at Ottawa has given particular attention to acquiring samples of sand and sandstone from different likely deposits in Canada, notably in the vicinity of Ottawa and Brockville. During the early summer of 1916, L. H. Cole, of the Dept. of Mines, paid a visit to several of the large American centres for the purpose of gathering details from the different laboratories as to the most modern and efficient method of examining and testing the various grades of sand and rock generally utilized for industrial purposes. The knowledge acquired on this trip enabled the department at Ottawa to install the most effective equipment for this specific purpose. Already this department has assumed fairly large proportions, and as these laboratories become better known their scope will likewise increase.

GENERAL VIEW OF MILL LOOKING EAST.

The importance of gaining and assimilating an exact and comprehensive knowledge of the country's resources along these lines is more evident every day, and the increasing number of inquiries concerning the industrial value of different sands and sandstones, exemplifies the essential character of the work.

Large Silica Rock Deposit

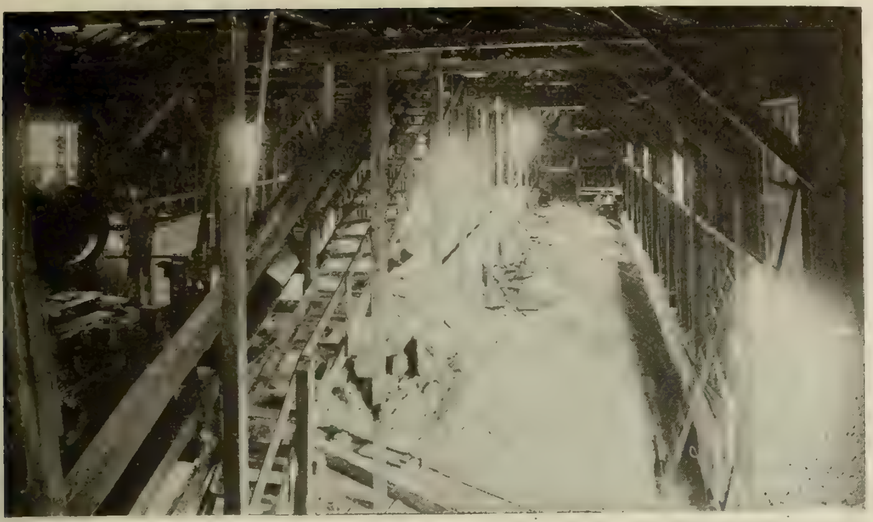
Two of the most extensive deposits of high grade silica rock yet found in Canada has been acquired by the Cascades Silica Products Co., of Montreal, this company having been recently organized by Aurelien Boyer, formerly of the Canadian Inspection and Testing Laboratories, Ltd., of Montreal, and Hector Frigon, formerly a director of the James Walker Hardware Co., of Montreal. The former is in practical control of the new company, while the latter has been appointed general manager.

Both of these valuable properties are located with a short distance of Montreal, the largest deposit being composed of the hardest mineral (quartzite), especially recommended by official authorities for the production of ferro-silicon. This property is located along the shore of the River St. Lawrence, about 30 miles west of Montreal, at the foot of the Soulanges Canal, thus providing excellent facilities for water transportation. It might be mentioned here that the company maintains, throughout the entire year, a large stock of silica sand in their storage yard at Cote St. Paul, Montreal.

The second and smaller deposit is situated near St. Canut, about 60 miles north of Montreal, on the C.N.R. The entire deposit on both these properties consists of highly refractory rock, and is particularly suited for all classes of foundry work.

Main Crusher Plant

Plant No. 1, at the foot of the Soulanges Canal, or Cascades Point, covers an area of about thirty-five acres, and includes a number of buildings equipped with the necessary machinery for efficient crushing of the sandstone and quartz. The mill is fully equipped with special machinery, many of the essential parts of which are made of the best manganese steel, to insure continuous and effective work under the hardest service. Beside the crusher plant are the pump houses, forge, stores, bunk house and office. Blasting is required to separate the rock from its formation in the quarry, from which it is delivered to the crusher plant by means of small narrow gauge push trucks. These loaded trucks are then drawn, by means of a wire cable, up an incline to a hop-



CONVEYOR BELTS AND STORAGE DEPARTMENT.

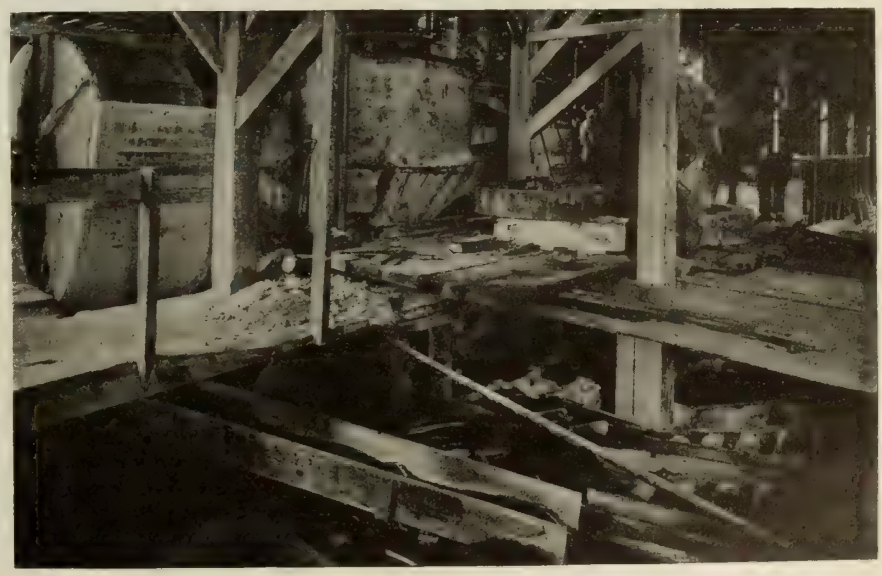
per, located above the main crusher where the initial crushing takes place. The rock is then ground in a chaser mill to the required size. When sufficiently ground the product passes through two large rotary screens, and then through a certain number of large endless screw washers where it is thoroughly washed.

After washing, the sand is allowed to fall on a large endless belt conveyor which transfers the material to the storage department. When loading a barge at the company's wharf, another conveyor belt is used to deliver the sand from the storage piles to the loading hopper, whence it is discharged into dumping cars that travel beneath the discharge opening of the hopper. These cars are then allowed to descend by gravity to the wharf, a distance of a few hundred feet from the storage plant. The mill compressor and loading machinery are operated by electric motors of a total capacity of 140 H. P.

Sand in any quantity can be shipped by water direct from the plant to the consumer, or to the Montreal storage yard of the Cascades Silica Products Co., whence it can be shipped by rail to outside points, or delivered by auto trucks to plants located in the city or immediate vicinity. This storage is also utilized exclusively when suspension of navigation prevents direct distribution from the plant.

Operation of plant No. 2 has not yet commenced but facilities are being provided to open this in the very near future.

The establishment of these crusher plants, for the production of silica sand from quartz and sandstone, marks the pioneer work of this character here in Canada. Initial operations by this company were for the production of a few grades of silica sand commonly used for foundry purposes, but the services of an expert engineer have been acuqired and additional machinery installed, which, with improvements now under way, will enable the company to produce in any quantity, any or all of the desired grades of sand or flour powder to satisfactorily answer any specific purpose. Owing to the perfectly clean character of the quarry rock no sorting out is required before crushing. The Cascades Silica Products Co., is therefore in a very advantageous position to develop this virgin Canadian industry to meet every requirement of the foundry and allied trades.



INSIDE VIEW OF MILL SHOWING GRINDING SCREENS AND WASHING EQUIPMENT.

LIMESTONE FLUX

By L. S. F.

The question is frequently asked of the foundry foreman, "What benefit is derived from putting limestone in the cupola when melting iron?" and the usual reply is, "Oh, if we did not do something the cupola would bung up and we would have to drop the bottom, but by using the stone the slag is thinned down so that it will run out of the slag spout and we can run much longer heats." This is true enough. The limestone takes care of the slag and prevents it from injuring the heat, but it does a lot more than prolong the heat. The sticky slag which is such a nuisance in the foundry is partly due to sand and dirt on the iron being charged, and parly from the non-metallic residue or foreign elements in the iron and the ash of the fuel. The lining and daubing in the cupola also burns out and is converted into slag. When the iron is being melted, the foreign matter also melts, and together they go down through the fuel to the bottom of the cupola. If the iron is melted hot enough the slag, being lighter than the iron, will separate itself to a considerable extent and float on top of the iron. But some of it will remain in the iron and no matter what precaution has been taken in making the moulds or pouring them, this undesirable material will be down in the interior of the castings after they are machined.

Flux is a substance which is lighter than iron and when melted in the cupola will float on the liquid iron, and being a thin slag itself it has an affinity for all slag which the iron has not. As the melted iron and slag drop to the bottom they pass through the liquid flux and the slag is absorbed while the metal passes through clean. The substance used as a flux usually consists of carbonate of lime which is found in the form of limestone, marble, oyster shells, fluorspar, etc. Limestone is the most commonly used and if of a quality fairly rich in lime, about fifty pounds should do for each ton of iron melted. It should be broken in small pieces and distributed on top of the charges of iron. Analysts tell us that they find very little difference in the analysis of iron which has been fluxed from that which has not been. To this we would say that the use of flux was not intended to change the chemical content of the metal, but to take the slag and dirt out of it. Metal might be perfect as regards chemical analysis and yet be useless for good work if it is dirty. There is no place where proofs are easier obtained than in the foundry. Try this out and be convinced. Don't begin to charge the stove in the middle of the heat after you have poured your best work. Flux the first charge.

MODERN METHODS FACILITATE MOLDING OF LARGE MARINE ENGINE CASTINGS

By M. E. C.

It is a remarkable fact that practically every writer of foundry literature selects as his subject "The Moulding of a steam cylinder," when he wishes to impress on the minds of his readers what he considers to be about the most difficult proposition which an iron moulder has to contend with. Now, as a matter of fact a cylinder is not such a difficult job to mould as might be imagined. The moulder has many a more perplexing problem to solve, but the one thing which places the cylinder in the foreground is the fact that if it is not in the first class it is not in any class. It simply must be perfect.

The causes of misfortune are numerous. A defective mould can be expected to produce a defective casting, but more often it is the quality of the metal which causes a cylinder to be lost. Either a wrong formula in the mixture, or the metal is improperly melted and fluxed, or it might be bad judgment in the pouring. Any of these points would make a good subject for discussion but at this time we will contemplate the making of the mould. The submarine activity has created an abnormal demand for marine engines; we will therefore confine ourselves to the moulding of cylinders of this class of engine.

A triple expansion engine has as is well known three cylinders, all for the same length of stroke, but of different diameter of bore. The smallest one is known as the high pressure, the next as the intermediate, and the largest as the low pressure. We will endeavor to describe the moulding of a low pressure cylinder with a bore of 54 inches and stroke of say 48 inches. A stroke of 48 inches would require a length of about five feet. The usual method until recently was to sweep the mould up in loam, but with the advent of powerful electric cranes and large ovens, etc., some foundrymen have undertaken to handle these big cylinders the same as they had been in the habit of doing with small ones, by just having a split pattern and ramming it up in a two-parted flask and drying it in the oven, after which it is finished in the usual way and poured lying on its side, but this method is certainly not advisable. It should by all means be poured on end, no matter what kind of a mould it is made in.

If it is desired to get away from loam moulding a better method than having the split pattern is to have the pattern of the plug type; all ribs and branches being loose from the plug. The cylinder will be moulded on end and the plug or main body of the pattern drawn up endwise. and the loose parts pulled in. The mould may be made in a flask which would not be any more cumbersome than the flask for the split pattern, or it may be bedded in the pit. in which case the bottom flange would require to be in sections, so that it could be drawn in. If the mould is too small for a man to work inside of, it will have to be cheeked off, but for a large one the pit is just as good, and a flat cope is all that is required. In pouring a cylinder on end a gate core is connected to the bottom flange and pop gates are placed on the top. All of the gates are connected to the same basin, but with the one leading to the bottom cut lower than the others. The metal is poured into the bottom one first, until the bottom of the mould is covered with a few inches of metal, after which the entire basin is flooded. The metal dropping from the pop gates keeps the metal, which is already in the mould, agitated and prevents any foreign elements from lodging in the casting. It is perhaps unnecessary to state that the cylinder is moulded reverse or pad side up.

Risers are taken off the pads and all undesirable elements which might have been in the iron will be in places where they can do little harm. The mould will be faced with dry sand facing and blackwashed and skin-dried. The cores must be made of material which will not cut and must be properly vented. If the moulder has been careful in ramming, rodding and venting his mould and has been particular to remove all loose dirt etc., there is no reason why he should not produce a first-class casting if he has been provided with iron suitable for a job of this kind, and has kept his runners full. The gates should be large enough to take the iron freely, but not so large as to bother the moulder in keeping them full. Let me say in conclusion that it is the little mistakes that spoil the big jobs, so avoid them. Don't use cheap dope in making your cores; don't consider the high cost of flour when mixing your facing, and don't try to pour your job with metal which sticks to the ladle. If you wish to mix steel with your iron, remember that it takes a much hotter fire to melt steel than it does to melt iron, and unless the steel is properly melted it will not properly mix with the iron. Whatever mixture you are using, bear in mind that if it is not such that you can drain the last drop out of the ladle, it is not suitable for a cylinder.

ACID RESISTING IRONS

By V. R. O.

The chief acid-resisting irons are silicon alloys, containing up to 15 per cent. of silicon. They are known under different trade names, such as Tantiron, Ironac, Duriron, etc. They are characterized by extreme hardness, which renders it impossible to machine them. Apparatus involving their use should be of simple form, and should not require any machining, except perhaps, facing by grinding. Their tensile strength is low, and they should not be subjected to high pressures. They are brittle, and a 4 per cent. silicon-iron shows a cubical crystal surface when fractured. There is considerable difficulty in casting to avoid soft patches

The effective life of a concentrated nitric acid pump may be as long as six months. The metal takes a very high polish and does not rust. Thick castings cannot be produced as internal stresses cause fracture.

The following are typical analyses of (1) Duriron and (2) Tantiron:

		Per cent.
(1)	Silicon	14 to 14.5
	Manganese	0.25 to 0.35
	Total carbon	0.20 to 0.60
	Phosphorus	0.05 to 0.10
	Sulphur	under 0.05

Melting point 2,550 deg. Fah. Sp. gr. 7.0. Compression strength 70,000 lb. per square inch Tensile strength 25 per cent. less than cast iron.

		Per cent.
(2)	Silicon	14 to 15.
	Sulphur	0.05 to 0.15
	Phosphorus	0.05 to 0.10
	Manganese	2.0 to 2.6
	Carbon (graphit)	0.75 to 1.25

Melting point about 2,550 deg. Fah.Sp. gr. 6.8. Tensile strength 6 to 7 tons per square inch.

According to Mr. D. Brownlie, writing in the Colliery Guardian, the amount of water evaporated by egg-ended boilers is slightly more than half that of a typical "Lancashire" boiler plant, and is certainly much more than would have been expected. The very poor efficiency of these boilers is indicated by the fact that the average figure for the evaporation of water per pound of coal is only about 3.90 pounds with good quality coal, whereas on the average colliery "Lancashire" boiler plant of to-day the figure for such coal would probably be about 6 pounds, and for a scientific and up-to-date "Lancashire" boiler plant the figure would be about 8 pounds.

The alternating current crane has one inherent safety feature not found in the crane with direct current motors in that the motor is built with a predetermined fixed torque, and a heavier load than this maximum torque will handle cannot be lifted, whereas, with the series wound direct current motor, there is no limit to the load it will attempt to lift, and if excessively overloaded the motor will burn out provided some part of the hoisting mechanism does not fail.

Writing in Nature on "Units and Unity," Mr. Napier Shaw says that if science is to be a part of practical life, the units of science and the units of practical life must be the same. One thing or the other: either practical folk must learn to use metric units, or British men of science must use British units in their laboratory courses. The present divorce between education and practice is ruinous for both. If we want instruments according to metric measures, we get them from instrumental makers who understand such measures. not from those who do not—that is. we tend to get our scientific instruments mostly from abroad—and so on in everything.

The Types and Industrial Uses of Pyrometers

The necessity for accurate temperature control of industrial processes has led to the development of the various types of pyrometers in present day use, from the delicate laboratory appliance to that of an industrial manufacturing appliance. The following article reproduced through the courtesy of Alfred Herbert, Ltd., illustrates some of the types and their uses.

THERE is no need, at the present time, to insist upon the necessity for pyrometers in connection with heating processes, because that necessity is well recognized.

Contrasting the position to-day with that which existed say fifteen years ago, we find that the pyrometer has advanced from the limited position of a delicate laboratory instrument to that of an industrial manufacturing appliance. When the pyrometer was only to be used in the laboratory, in the hands of specially trained experts, the problem, from the point of view of the instrument maker, was relatively simple, although the instrument maker did not so consider it in those days. The laboratory pyrometer made occasional excursions into the works, usually with disastrous results, at any rate, to the pyrometer.

However, it became obvious that the information, with regard to the influence of accurate temperature regulation upon the resulting product could not be of any industrial value unless pyrometers could be applied to the industrial heating processes involved, therefore it was necessary to design pyrometers which could be used safely in the works.

The time has now come when the user of pyrometers under industrial conditions should know more about the principles upon which those instruments operate, the various factors which enter into the design and successful application of any type of pyrometer to industrial heating processes.

Pyrometer Classification

Pyrometers may be divided into two broad classes as follows:

"A." "Contact" or inserted pyrometers, in which some portion of the apparatus is actually subjected to the temperature to be measured such as:

1. Expansion instruments, the mercury-in-glass thermometer, and various other types in which differential expansion of some kind, either liquid or solid, is the means of measurement.

2.—The electric resistance thermometer, depending for its action upon the change in resistance by a coil of wire when its temperature changes.

3.—The thermo-electric or thermocouple pyrometer, depending for its action upon the electro-motive force or voltage developed at the junction between two dissimilar metals or alloys when that junction is heated to a temperature different from the remainder of the electric circuit.

4.—Melting-point pyrometers, in which the melting of some alloy or mixture of salts or clay indicates the passage above a certain fixed temperature, these may be termed "fixed point pyrometers."

"B." "Distant" pyrometers, in which no part of the instrument is subjected to the actual temperature to be measured, but which operates entirely at a distance from the hot body under measurement, comprising:—

5.—The optical pyrometer, in which the measurement of temperature is made by matching the brightness or color of the hot body against that of a standard in the instrument and computing the temperature by the adjustment which has to be made in the instrument.

6.—The "total radiation" pyrometer, which measures the temperature of the hot body by means of the radiated energy therefrom, both luminous and non-luminous.

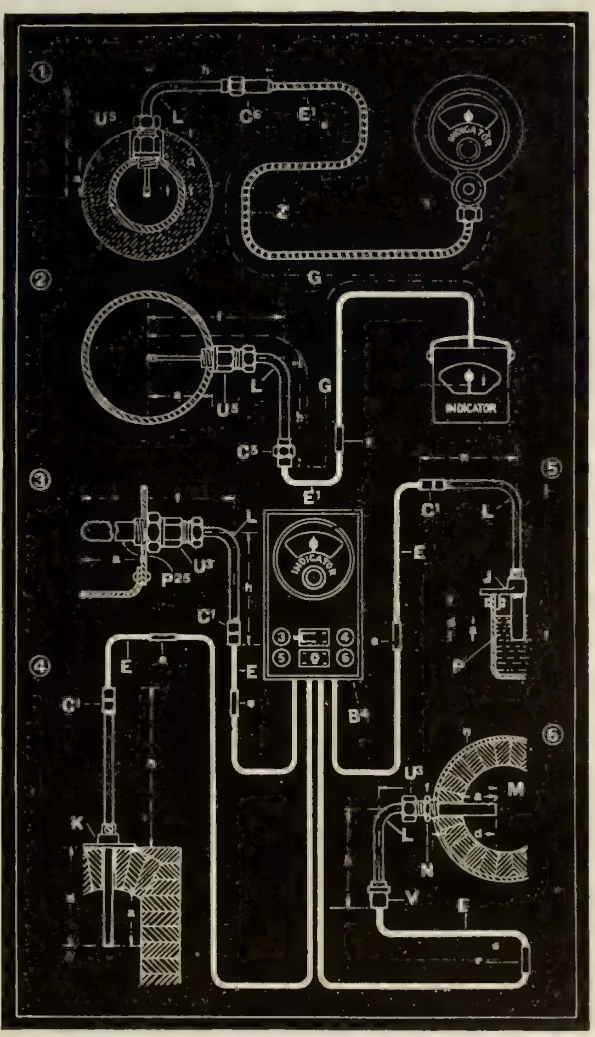


FIG. 1.

Variation In Indications

It must be remembered that a pyrometer in which the sensitive portion is subjected to the temperature measures actually the temperature of its sensitive portion. It is clear that the temperature of the "hot junction" may be different from the material in the furnace, bath or other apparatus, due to the conditions briefly mentioned below.

(a) Thermal conduction of the pyrometer sheath. It is usual, and generally necessary, to employ an outer sheath to protect the actual thermo-couple from the action of the furnace gases or the material in a bath. Heat is transmitted from the furnace gases or bath through the sheath to the thermo couple "hot junction," and if this sheath is of large cross section some of this heat will be conducted away along the length of the sheath and will not reach the thermo-couple. This lost heat may result in the thermo-couple junction being at a lower temperature than the furnace or bath if sufficient depth of insertion is not provided.

(b) Temperature inequality in the furnace or bath. In direct fired furnaces, particularly when the door or other opening is large in relation to the furnace and is opened frequently, large differences may exist between different parts of the furnace.

(c) Unless the material which is under treatment is left in the furnace or bath a sufficient time it will not attain the temperature of the furnace, and therefore may be at a much lower temperature than that measured by the inserted pprometer.

These conditions and limitations apply with equal force to other types of pyrometer than the thermo-couple—in fact, in the case of the electric resistance or expansion instruments the larger bulk of the sensitive portion may aggravate the resulting errors.

Suitability of Contact Pyrometers

From the foregoing considerations it will be clear that the "contact" or inserted pyrometer is suitable for those cases in which the material under treatment remains in a closed furnace or in a bath for a time sufficient to ensure reasonable equality of temperature, and to cases in

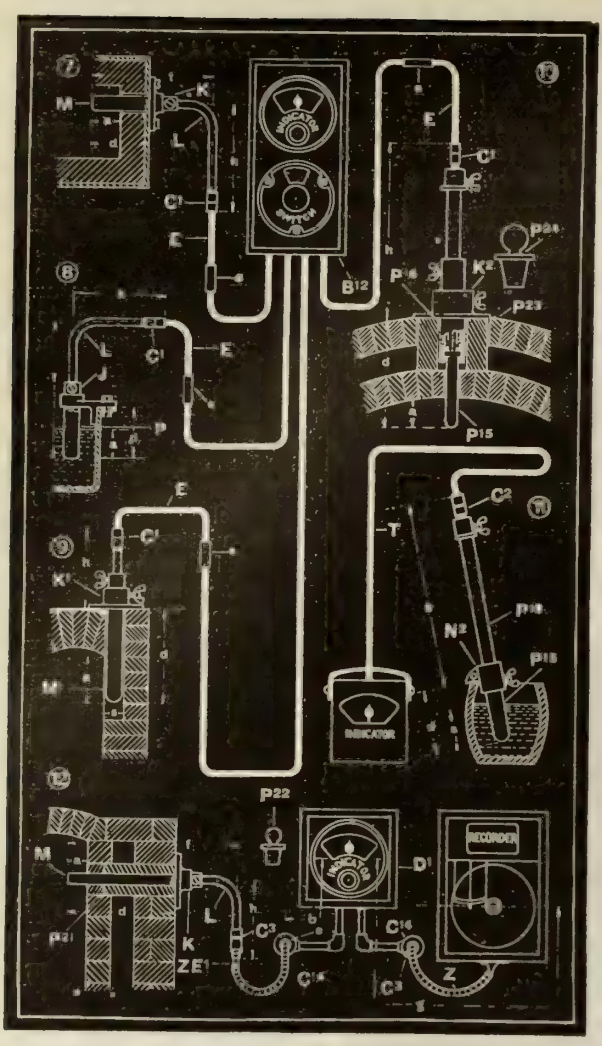


FIG. 2.

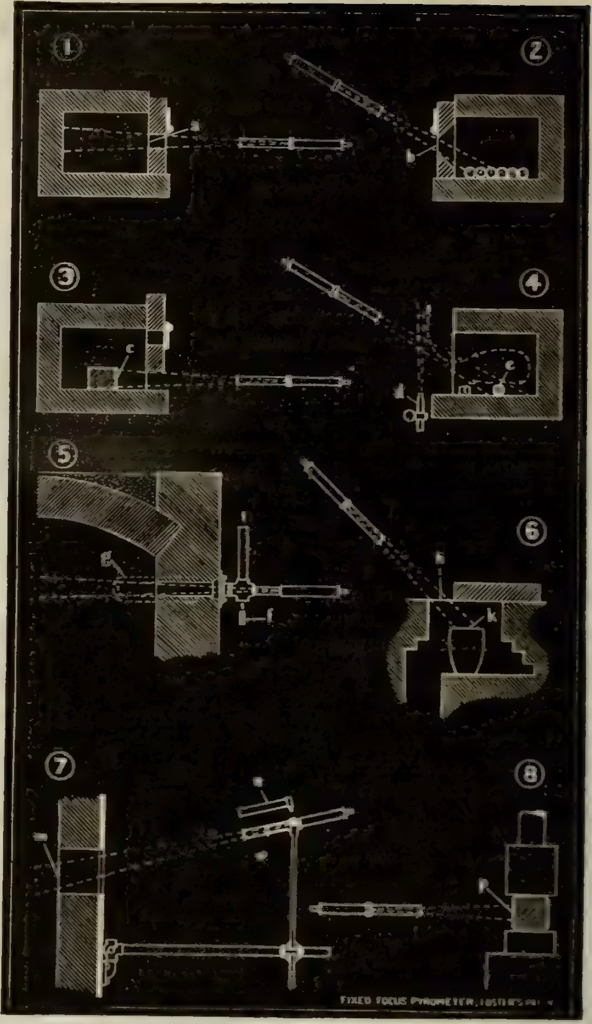


FIG. 8.

which the furnace temperature, as measured by the pyrometer, is kept at a steady figure and the material, of uniform heat capacity, is fed into and out of the furnace at a uniform rate.

Distant Pyrometers

Turning to the "distant" pyrometers, optical or total radiation, the measurement being made by the radiated light or heat, the pyrometer, if correctly used, will measure the temperature of the surface presented to it. That surface may be the inner wall of a furnace or the material in a furnace. The use of a radiation or optical pyrometer is subject to the following limitations:

(d) Unless the pyrometer is specially calibrated for other conditions, the hot body under measurement must be within a deep enclosure which is fairly uniformly heated. If these conditions do not obtain the measurement will be dependent upon the reflecting power of the surface of the hot body. It is, however, possible to calibrate these pyrometers for given surfaces out in the open or to apply a factor to the observed reading.

(e) The heat or light radiated from the hot body to the pyrometer must not be intercepted by smoke or gases containing solid particles. In the case of the optical instrument luminous flames, even though not containing solid particles, may, nevertheless, affect the reading very largely. The "total radiation" instrument is very little affected by clear flames, hence this latter type is frequently preferable for use by relatively unskilled observers.

The remarks under (d) and (e) show that the "distant" pyrometer is particularly suitable for work of an exploring nature and for the measurement of temperature of individual pieces of material or particular parts of a furnace. It is also, of course, preferable where the temperatures to be measured are very high and where consequently the life of the thermo-couple sheath and sensitive tip would be short.

The "total radiation" instrument has the advantage of being practically automatic in action, so that it can be used as a simple indicating or as a recording instrument, it does not require manipulation or adjustment by the user. It has the disadvantage of requiring a relatively large hot body surface for measurement, though this disadvantage is more apparent in the laboratory than in works practice.

The optical pyrometer can not be made directly indicating or recording, it depends upon the adjustment by the user to make a measurement. It is, however, useful when the hot body under measurement is small.

Turning again to the thermo-couple pyrometer, experience shows that the detail arrangement and application of the instrument to the furnace or bath have a very large influence upon its success.

Pyrometer Location

If the pyrometer is inserted through the crown of the furnace, as shown at Station 4 in Fig. 1, and projects deeply into the furnace space, it is frequently found to be in the way of the work in the furnace. If the same position is retained and the depth in the furnace reduced, one or two troubles may be met. If the furnace is uniformly heated the pyrometer may read low due to insufficient depth of insertion. If, alternatively, the furnace is heated largely by radiation from the furnace crown and flames at a higher temperature are passing along under the furnace crown to maintain its temperature, then the pyrometer will have its hot junction directly in the path of these flames, and will tend to measure their temperature rather than that of the material in the furnace. Added to this trouble is the fact that the life of the pyrometer sheath would be short under these circumstances.

Occasionally insertion through the side of the furnace is preferable in the manner shown at Station 7, Fig. 2, though the same class of difficulty may arise here. A preferable method of insertion is shown at Station 9, in Fig. 2. In this arrangement a pocket or channel is cut in the side of the furnace and the pyrometer sheath installed therein. In this way the flames in the furnace will not impinge directly upon the sheath, the sheath being heated largely by radiation from the furnace walls and from the material in the furnace.

In a large number of furnaces the arrangement is such that the pyrometer sheath has to cross an outer fire or flue space before reaching the working space of the furnace, and here again special consideration must be given to the details of installation. The gases in this fire space may be at a temperature very different from that in the working space of the furnace, and this temperature will influence the reading of the pyrometer unless particular care is taken to keep that temperature away from the sensitive tip of the pyrometer. Two different methods of installation are shown at Stations 10 and 12, in Fig. 2, to meet such cases.

When considering the application of the pyrometer to a bath of molten salt or metal, the sheath is extremely important, but it is not at all easy to secure a satisfactory sheath where the temperature is high. The bath, however, has the great advantage of giving good heat conduction from the bath to the sheath and approximate equality of temperature in various parts of the bath. Typical methods of installation are shown at Station 5, Fig. 1, and Station 8, Fig. 2.

In the foundry work on low melting alloys, non-ferrous alloys and aluminium constitutes a field in which the use of the thermo-couple pyrometer is being rapidly extended. Previous to the adoption of the Hoskins' alloys nickel-nickel chromium, there was no practicable thermo-couple which could be inserted unprotected by a sheath in these metals, the alloying effect was so great that the thermo-couple was destroyed after a very few readings.

The use of a sheath, as indicated at Station 11, in Fig. 2, is legitimate only where the time lag due to the heat capacity of the sheath is not an objection. Usually in foundry work the time lag of the sheath is an objection, and fortunately in such cases the Hoskins' alloy thermo-couple provides a solution of the problem.

It is made with fairly thick wires, and the tip of the thermo-couple is inserted directly into the molten metal, but removed as soon as a steady reading is attained. The thermo-couple wires are alloyed away by the molten metal at a rate varying with the nature of the alloy being melted, but with non-ferrous alloys and aluminium this rate is sufficiently slow to enable a large number of readings to be made before a thermo-couple renewal is necessary. When that renewal is necessary its cost is not very large, therefore the method is commercially justifiable.

After the fused junction between the two alloys has been destroyed by the molten metal the metal itself forms a junction so that this use of the pyrometer can be continued without making a new junction.

Details of Electric Circuits

Time and money spent upon the details of the electric circuit of a thermo-couple pyrometer are a good investment. It is a mistake to wire up a pyrometer with "bell wire." It has been found that heavy cable well protected—as, for instance, by screwed conduit, as shown at Station 12, Fig. 2—is well worth the time and trouble taken in the first installation. Similarly switch connections should be large, simple and easily adjusted. It should be remembered that the voltages available in pyrometer circuits are extremely low, frequently only small fractions of a volt and that circuit accessories which are quite suitable for lighting or power circuits will not give reliable results in a pyrometer circuit, the voltage is not enough to break down a film of oxide or other surface corrosion.

The indicating or recording instruments to be used with the thermo-couple should be sufficiently robust to withstand the unavoidable rough usage frequently met with in industrial work. Delicate suspensions are quite out of place in the works. Notwithstanding the maximum robustness attainable, it is advisable to choose favorable positions for instruments which are permanently installed.

Radiation Pyrometers

In the case of the "total radiation" pyrometer protecting sheaths are not required, and therefore the application of these instruments is in many cases much simpler. In view of the valuable exploring service which can be obtained from a radiation pyrometer, that instrument is most frequently made in a portable form, though there are many cases also where it is permanently installed as a recording instrument.

When considering a hot body inside a furnace or other approximately uniformly heated enclosure, the temperature measured is that of the surface presented to the instrument. For instance, at Station 1, Fig. 3, the surface being measured is the back wall of the furnace.

At Station 2 the peep hole has been coned out to allow of measurement of the temperature of the hot bodies lying on the floor of the furnace. This figure also indicates a method whereby a number of hot bodies being treated together may be made to provide a large enough surface for the pyrometer, although individually the hot bodies are small.

In Station 3 the door is shown raised to measure the temperature of the hot body "c."

As previously mentioned, the radiation pyrometer requires a relatively large hot body, but where a single small hot body is under treatment it is possible to measure its temperature if it is allowed to rest upon the floor of the furnace or against the wall of a furnace and to heat up until, by the eye, it has the same brightness as the surface against which it rests. Station 4 in Fig. 3 illustrates this method of use.

In using a radiation pyrometer it is, of course, necessary to prevent flames from the furnace reaching the pyrometer; it is equally necessary to prevent furnace gases from entering the pyrometer receiving tube, although these gases may not be visible as flames. There is usually little chance of this happening, but where the danger does exist it may be guarded against by arranging a cross blast of air to blow away any flames or products of combustion which might otherwise enter the receiving tube of the pyrometer. Such an arrangement is shown at Station 4, Fig. 3.

In the foundry the radiation pyrometer is useful for exploring the temperature of a pot furnace. In order that the temperature as measured may be independent of the nature of the surface under measurement the lid of the furnace is only partially removed, as shown at Station 6, Fig. 3.

Station 7 shows a method whereby the radiation pyrometer is used upon an adjustable bracket for permanent work as, for instance, a recording instrument.

As mentioned previously, the radiation pyrometer may be used, by means of a special calibration, upon hot body surfaces which are out in the open and not in uniformly heated enclosures. In such cases the reflecting power of the hot body must be taken account of.

Any surface which has reflecting power will radiate less energy than a non-reflecting body; it is not what is known technically as a "black body," that is, it is not a body which would appear dead black if it were cool.

Fortunately the oxidised surfaces of iron, steel, copper, whether molten or solid, radiate with an efficiency which is approximately a uniform percentage below that of the "black body," therefore the radiation pyrometer may be calibrated for use under such circumstances with sufficient accuracy for industrial purposes.

For instance, the temperature of a forging under the hammer may be measured, without interrupting the process, in a manner indicated diagrammatically at Station 8, Fig. 3. Of course, in such cases, it is necessary to remove dross or any non-adherent scale before a measurement is made.

When Le Chatelier first developed his thermo-couple pyrometer he employed thermo-couple wires of pure platinum against platinum alloyed with 10 per cent. of rhodium. He chose these wires because they were of high melting point and were relatively unalterable.

It has subsequently been found, however, that these wires are influenced seriously by reducing gases and the metal vapors which may exist in those gases. The wires become crystallized and also suffer a fall in E.M.F., and therefore a change of calibration, frequently of large amount, before the wires fractured.

Owing to the high expense of platinum in these alloys the wires are necessarily very thin and therefore liable to rapid attack, while the user is tempted to continue their use as long as possible owing to the very high cost of replacement.

Having chosen the alloys, the problem was then to devise a galvanometer suitable for use as an indicating instrument. The alloys, being expensive, were used in the form of very thin wires, about a fiftieth of an inch diameter; they were therefore of high electrical resistance and subject to a large increase in resistance when heated up in the furnace. In order to mask the change in calibration which would follow this increase in resistance, an indicating instrument was used which had a very high internal resistance so that the change in resistance in the circuit was relatively small. Since the copper wire in the coil of this indicating instrument was itself subject to an increase in resistance when the instrument became hot, a further "ballast" resistance had to be added in the form of a wire whose resistance did not increase when heated up. The net result of this high internal resistance was an instrument having very weak moving forces, because the electro-motive force or voltage of the platinum-platinum rhodium thermo-couple was in itself very small.

The discovery that "base metals"—that is, cheaper alloys—could be used as reliable thermo-couple opened up a new field in pyrometry, and it has been found that for all except very high temperatures the base metal thermo-couple forms a reliable industrial pyrometer. The Hoskins' alloys, nickel-nickel-chromium or nickel chromium-nickel copper have the advantage that they are much cheaper than the platinum alloys, and therefore may be used in the form of thick wires, and the further advantage of a much larger electro-motive force. As the wires are thick they are of low resistance, and fortunately also they have very small increase in resistance when they are heated up in the furnace. Therefore the necessity of having an indicating instrument of high internal resistance is no longer usually prominent. If the whole circuit resistance is low the current flowing in the circuit will be proportionately larger, and the net result is that the moving forces in a low resistance "base metal" pyrometer using the Hoskins' alloys are of the order of fifty times as great as those of the high resistance platinum alloy pyrometer. The gain in robustness and suitability for industrial work will be obvious.

It has been pointed out already that a sheath is necessary to protect the thermo-couple, as far as possible, from the influence of contaminating vapors. In the case of the platinum alloy thermo-couple this sheath must be literally impervious to gases. Unfortunately, the only materials which can approach this condition of imperviousness are, in themselves, fragile—for instance, silica (quartz) or glazed porcelain. In industrial work it is the sheath which sets the practical limit to the temperature at which a platinum alloy thermo-couple may be used, and this maximum temperature is unfortunately many hundreds of degrees below the melting point of the thermo-couple wires, therefore the fact that the melting point is very high is really of no practical value.

Admittedly, the base metal alloys have much lower melting points, but since the question of the sheath sets the limit still lower than the melting point, this fact is of small practical interest under industrial circumstances. To formulate an approximate general rule it may be said that above 1,000° C. for continuous work or 1,300° C. for intermittent work, no thermo-couple could be used under industrial conditions usually obtaining. For this reason the preference for the radiation pyrometer becomes greater as the temperature increases.

Of course the adoption of the low resistance circuit is quite out of the question with a platinum alloy thermo-couple, but the low resistance circuit cannot be advanced as an entire disadvantage to the base metal thermo-couple because the conditions of mechanical robustness would usually make advisable a fairly heavy gauge of copper connecting wire, and in any case the cost of the copper connections is relatively a small fraction of the total installation cost. In the choice of a sheath for a base metal thermo-couple the field is very much wider; metal sheaths may be used with consequent increase in mechanical robustness and reduction in cost. The Hoskins' nickel chromium alloys cast in the form of a sheath give particularly good service under severe conditions up to about 950° C. Of course, such a sheath cannot be used with a platinum alloy thermo-couple because the metal vapors emanating from the sheath itself would contaminate the thermo-couple.

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ADVANTAGES OF LOAM MOULDING FOR ORDINARY FOUNDRY WORK

By L. M. G.

A branch of the moulding art which seems to have lost favor to a considerable extent is loam moulding. The average moulder looks with a sort of awe upon a loam job as though only a select few of the extra intelligent class could be expected to understand it, yet loam moulding is not hard to master and it has many advantages not found in any other branch of the trade.

Instead of moulding in a flask, the mould is built of brick, laid in mud and plastered over with the loam mixture. Mud is simply gangway sand mixed with water or thin clay wash, and is better to be mixed about one to ten with sawdust.

Loam mixtures are about as variable as core sand mixtures and can be made from most anything which happens to be handy. About four parts of silica sand and two parts of New Jersey moulding sand, and one part of sawdust or dried horse manure, makes a good loam, by mixing it with good stiff clay to the consistency of mortar. These brands of sand, however, are not always to hand, and I have done good work with a mixture of three parts good clean coarse sharp sand, two parts coarse moulding sand, and one part horse manure, mixed with clay wash, made from fire clay. Loam moulding is really interesting work. For very heavy castings it is practically indispensable and for complicated castings, where the cost of patterns would probably be greater than the returns, it can be resorted to. Circular jobs can be swept up with the edge of a board instead of requiring a segment of the pattern as is the case in sand moulding. Complete patterns can be moulded in loam, while many a job can be done without either pattern or sweep by building the mould to a plan.

A simple job such as an anvil block could be made in loam without a pattern almost as easy as it could be moulded in sand with a pattern, and a much nicer casting will be secured. To make such a mould, dig a pit in the floor and ram down a coke bed the same as for a sand mould and connect vent pipe leading to the surface. Lay the bricks on edge for the bottom and vent with wire through the mud joints down to the coke bed. Level up straight edges and spread on the loam with hands and strike off level to the straight edges. The walls will be built up in the same manner, venting clean through the joints. The loam should be not less than half-inch thick and the top of the wall should be levelled up with loam. Slip is made by thinning down some of the loam with molasses water and running it through a fine sieve; just enough slip is used to make the mould smoothe, after which it is black-washed and thoroughly dried. A fire which is hot enough to dry all of the moisture out of the mould will burn out all of the sawdust or whatever was used for the purpose, leaving the loam porous like a sponge. This gives vent and allows the metal to lie without boiling or scabbing the face, which it otherwise would not do on account of so much clay. The black wash prevents the metal from getting into the pores. A mould of this kind can be poured open, or a dry sand cope can be used, or a loom cover can be struck up on a pricker plate and dried.

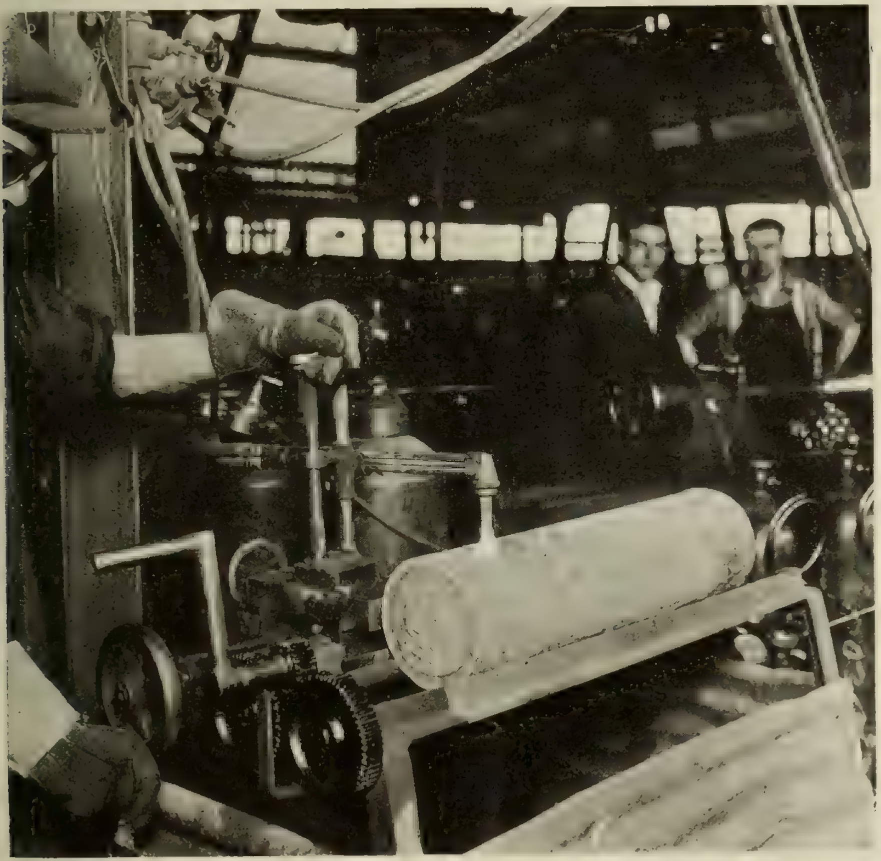
A common way of gating a piece like this is to pop it on top and place a clean piece of scrap under the gate for the first iron to strike so as to not cut the bottom (the scrap will dissolve before the mould is full). Or a gate core could have been built into the brick work near the bottom and extend up the outside. Before pouring the mould straw is wound around the brickwork to facilitate the escape of gases through the vent, after which the sand is rammed between the mould and the walls of the pit to keep it from spreading when filled with molten iron. This is a crude example of loam moulding but is such as a novice could practice on, and once used to the nature of the material used, he could do as good a class of work in loam as he could do in sand.

CUTTING TEST PIECES FROM SHELLS

A new machine for cutting test pieces from shells by means of an oxy-acetylene torch, has been developed and put on the market by the W. R. Carter Welding Co., York street, Hamilton, Ont. The machine is being built for 6-inch, 9.2-inch and 12-inch shells.

The frame of the machine consists of angles welded together, forming a stand for carrying the shell and cutting outfit. As will be seen from the illustration, the oxy-acetylene torch is carried on a fixture which can be moved lengthways on the machine as well as across. The fixture is traversed by means of a screw and handwheel.

The shell as shown in the illustration is resting on longitudinal rollers revolved by the crank through gears. The test piece is first cut out from the shell body as shown, the fixture carrying torch travelling along while cutting in a longitudinal direction. When cutting across, the shell is turned by means of the crank, while the torch is in operation. While the base is being cut off the torch is stationary and the shell is turned round. The complete operation has been done in four minutes.



CUTTING TEST PIECE FROM SHELL FORGING BY OXY-ACETYLENE TORCH.

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WOMAN IN WORKSHOPS

By R. E. D.

There is very little attention being paid to the future of female labor in engineering, although it is generally admitted that it will be one of the most difficult problems we shall have to solve during the period of reconstruction. It is surprising that women were not engaged in engineering before the war considering that they were employed in many industries that were manifestly less suited to them; but there is some consolation in the thought that insular conservatism was not responsible for this, as even in Germany their value was not realized until some sufficient male labor could not be had. They have become so important a part of the producing machine now that it is difficult to see how they can be ejected from it when the most pressing need for their labor is past. This is looking at it from the purely economic standpoint and ignoring the social danger that would be incurred by throwing these women on the labor market. Many of them will return to their domestic duties when their husbands return from the army, but many more will desire to make their new vocation their life work, and it is in the interests of industry that they should be allowed to do so. But their sphere of usefulness is limited, and their greatest value is not realized when they are employed at work for which they are unsuited. For example, girls or women may be useful in the coreshop, but the heavy labor of the foundry floor is the man's work. It would have been a wise policy if, when it was first determined to introduce women into the engineering workshops, a committee of experts had been appointed to consider any advice on the best method of training them for suitable classes of work. We might now have had a great army of really skilled women workers who would have released more men for the colors.

It is erroneous to suppose that the only opponent of woman labor is the skilled male worker. The foremen's opposition has been potent during the war. The workman's prejudice is logical, and is usually based on the fear of undercutting. The history of woman in industry is not pleasant reading. Invariably she has been used to keep down the rate of wages, and consequently, lower the living standard. The only way to eliminate the risk is to abolish sex rivalry. If workmen would open their unions to woman, they would find them loyal members of their craft. It may be admitted, however, that women in certain work require more help, because of the physical weakness, than men, and it may thus be economical to an employer to pay them the same rate of wages as men. This difficulty could be adjusted amicably, however, between the workers and employers in conference.

The war period has seen new developments in engineering. The petrol engine has advanced wonderfully, and the manufacture of aeroplanes, while it is not likely that it will continue in its present conditions or proportions, is a permanent addition to engineering activity. It is probable that it is in motor car and aeroplane work that women will score her greatest successes, although even in the general works there is room for her. It will be interesting to observe the effect of women's entrance into engineering shops on workshop conditions. She enters with a mind unbiased and unbittered by the memories of industrial struggles and unprejudiced by worn out customs. Women may be inherently no more conscientious than men, but the "ca canny" policy is not likely to be favored by them; indeed, it is more a disease than a policy, a disease which has become chronic because of the stupid relations between employers and men in the past. Apart altogether from their influence on wages, however, it is probable they will demonstrate a zeal of reforms effecting the hygiene and sanitary conditions of the shops, which will make for efficiency and, ocnsequently, increased productivity.

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A source of trouble of the rifleman is cupro-nickel fouling in his rifle. It is not sufficient merely to wipe out the powder residue from the modern rifle and oil it before putting it away, but the rifle must be washed out with a solution powerful enough to dissolve the cupro-nickel fouling. For this purpose a solution of aqua ammonia, ammonium carbonate, and ammonium persulphate is being used in the United States, says the Ironmonger. The two salts are dissolved in the aqua ammonia and the solution is poured into the rifle barrel to dissolve the cupro-nickel deposit. After leaving the solution in the barrel for about five minutes, in which time it turns green from the nickel dissolved, the barrel is wiped dry without delay and then oiled.

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Mistaken Idea of Secrets of the Trade

DID you ever come in contact with the mechanic who was always afraid that some person else in the shop would learn his ways and methods of doing certain jobs? The chances are that if you have had much experience you have met this chap several times over.

He has failed and failed miserably to grasp the idea that giving away knowledge does not make him any poorer, neither does the withholding of it make him any richer.

There are men to-day who might have developed into real good mechanics had it not been for the "stand pat" type of mechanic with whom they became associated early in their experience. This mechanic, perhaps a foreman, failed to make the trade interesting. He kept his ways and devices under a bushel. He always made it a plan to let the new man "go in and find out for himself." He may have done it to try and develop initiative in the men under him, but it does not work out that way. Apprentices came to him, they served their time, and they went their way. They might have been experts—they might have left that shop qualified to go in any place and begin work—they might have gone out knowing that they were "real mechanics." But they didn't. They may have dropped into better environment later on, when they would have a chance to develop the real things of the trade. But the fact remains that there are shops, and plenty of them, where the mechanics have not yet learned the great truth that it pays handsomely to make the young apprentice a capable hand before he leaves the shop.

There is another phase to this same situation, and that is the experience that mechanics can pass along and put on record through the medium of such papers as CANADIAN MACHINERY. The mechanic who has had experience that makes work easier, that brings better results for the firm, has a responsibility, and that responsibility is to try and bring others up to the same standard of efficiency he himself has reached. Firms are often forced to spend hundreds and thousands of dollars in experimenting to find out what some other group of men already know. The result is that industry—viewed from the larger scope in the national field—loses, and a tremendous amount of energy is wasted, all because the mechanic with the knowledge saw best to keep it to himself.

Remember this. You are not going to be any poorer because some person else knows as much as you do. It is not going to cut the ground from under your feet because you help some other chap to get the training that will enable him to hold down a good position and do the work well. Your reward will be greater than any that a paper can pay for your material. It will be in the form of satisfaction in having helped some person to make two dollars where he was making one, and in making a good mechanic out of the chap who is now being pitchforked out of the shop as a handyman.

Alberta And Its Big Problem

ALBERTA coal is surely having a merry time trying to make its bow to the people of Winnipeg. If all the energy that has been spent in investigating and reporting had been applied directly to the production and application of coal there would be quite a few bins filled to the ears by now.

Here's the way the situation is summed up in one of the numerous reports that have been issued:

> In this connection, it is claimed that the majority of Winnipeg dealers are absolutely hostile to Alberta coal, while a few who are genuinely boosting it are carried away by their zeal and led to extravagant claims which must result in dissatisfied consumers.

Now the thing most necessary seems to be a quota of dealers who will have just the right amount of thuse in their system. They must not blow off too hard or the consumers will expect too much. Neither must they be too frigid or the frigidity is likely to extend to the order books. Apparently it has not occurred to them to let the dealers get out and peddle coal like they used to pitchfork real estate bargains around.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

THE CORROSION OF IRON AND STEEL AND TS PREVENTION

By Abe Winters.

ANOTHER fact which is well founded is that the presence of free iron has a marked effect in producing a precipitation of a vapor or suspended matter in a gas. It follows, therefore, that if a metal be heated in the presence of a vapor under such conditions that the gases or vapor contained within the metal are in part liberated; then, as the liberated gases or vapors contain some free ions, they will cause the precipitation within the pores of the metal and on the surface layer of a portion of the external vapor in which the metal is heated.

That all materials have a definite vapor tension is well known, this tension depending mainly on the nature of the material, the nature of the surrounding materials, the temperature and the pressure. It therefore follows that under all conditions all substances are surrounded by a certain amount of their own vapor. The vapor can be increased in amount by increasing the temperature and decreasing the pressure. Zinc vapor can be produced in several ways from zinc. If molten zinc is boiled in a reducing atmosphere, vapor is given off rapidly, and if heated iron is brought in contact with this vapor sherardizing would take place. This method is neither convenient nor economical because of the waste of zinc. The most practical and economical method is to use zinc dust, which is obtained as a by-product of a zinc smelter. This dust is practically amorphous, and each particle consists of a small inner particle of more or less pure zinc surrounded by a thin coating of zinc oxide. This oxide is very inert compared to metallic zinc and has a high melting point. It therefore is very advantageous in the process because it not only keeps the particles of zinc separated but allows the spheres of vapor surrounding them to act independently with a high vapor tension and permits the temperature to be raised beyond the melting point of zinc without its becoming molten. Therefore the percentage of inert material in the zinc dust plays an important part in the process.

Temperature and Time Important Factors

Temperature and time are factors which, depending upon each other, are very important in the process of sherardizing. They depend on the choice and quality of zinc dust used and also on the requirements and physical properties of the sherardized material. According to authorities on vapor tension, with an increase of temperature from 325 to 375 deg. C., the relative vapor tension increases 14 times and from 375 to 425 deg. C., the relative vapor tension increases 14 times and from 375 to 425 deg. C. the relative vapor tension increases 92 times. Zinc boils under ordinary pressure at 918 deg. C., and the boiling point under vacuum is reduced to 548 deg. C. Iron on being heated from 500 to 600 deg. C. in vacuum gives off gases readily. Therefore, it is quite clear that in vacuum the conditions are best for sherardizing. Since articles of different size, shape and character are treated, if each were given its ideal condition of temperature and quality of zinc dust, the time of treatment of all would be alike, but this is not practicable, for it is easier to vary the time of the process than the other factors. It is possible to obtain almost instantaneous sherardizing in the case of wire heated to a high temperature and allowed to pass through zinc dust at normal temperature. Not only the time of heating the article during process should be considered but also time of cooling, slow cooling is preferable for two reasons: First, to prevent loss from exposing hot zinc dust to the atmosphere (the metallic zinc particles would quickly oxidize): second, to prevent the articles being chilled too quickly. An article to be sherardized must be regarded first in respect to its ability to absorb zinc vapor, and then the condition under which zinc produces vapor at the highest tension. The most favorable condition under which the given article will absorb the most vapor must be obtained. In some cases it will be a selection of temperature or pressure; in some cases it will be the treatment of the article, as annealing, or the treatment of the surface mechanically (sand blasting or tumbling), or a chemical treatment such as pickling. A brighter metallic coating is obtained by using the manufactured zinc dust than with the blue dust, which is a by-product, the latter can be used with a lower metallic percentage and does not require as long time in processing and cooling and there is less danger of fusion of zinc due to slight overstepping the temperature limit.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING

The Occident Hall, corner of Queen and Bathurst Streets, Fourth Thursday of each month, at 8 p.m.

When the article sherardized will be subjected to sharp bending or considerable variations of temperature, the thickness of coating will be limited, for zinc, being more brittle and having a different co-efficient of expansion than iron, will separate from the iron under these extreme conditions if too thick a coating is applied. Perhaps the greatest advantage of sherardizing, which makes it adapted where other processes are impracticable, is the fact that it gives a uniform coating over the entire surface, such as the inside and outside of hollow articles, on threads of pipes, bolts, nuts and on woven wire cloth. Because of its great adhering and alloying properties with the iron, the coating makes a very good basis or intermediate coating when plating upon iron with such metals as copper, tin or nickel, but combinations of this kind are not advised if most efficient protection from corrosion are desired.

According to Prof. C. F. Burgess, of Wisconsin University, if a sherardized surface is scratched by a file and exposed to the alternate action of air and water, rust will form in this scratch. filling it up and bridging it over and apparently bringing the action to a stop. This rust comes from the iron liberated from the electro-positive coating rather than from the underlying iron. Thus, a defect in a sherardized coating apparently tends to heal itself over while with other forms of covering the defect becomes exaggerated. Professor R. B. Leighon and Prof. H. A. Calderwood state that a sherardized coating should afford protection over a longer period of time and yield less readily to corrosion than an electro-galvanized surface, due to the fact that the former is less electro-positive to iron than the latter, their potentials being given as 0.296 volt for sherardizing and 0.472 volt for the electro-galvanizing. An abrasion test by these gentlemen, on a sherardized sample having three times the initial weight of zinc before the test showed twenty-two times as much after test as the electro-zinced sample, while another with about one and three-quarters times as much as the best electro-galvanized at the beginning had five times as much at the end, showing that sherardized surface is much more resistant to abrasion.

Commercial Requirements

In general, a protection against corrosion should conform to several conditions for commercial work. Prominent among these conditions are the following: The coating must be durable and of a reasonably permanent character. It must be conveniently produced at small initial cost and with low operating expense. It must be adapted to the particular requirements of selected products.

There must be uniformity of results and conditions governing same. The coating must be controllable by predetermination of conditions affecting the production of the coating. The coating must have certain physical properties relating to strength or elasticity which are conclusive to resistance to wear or exposure to the elements, and the finished article must be of pleasing appearance.

The question may be asked why copper is being used so extensively on munitions for the British army. The answer is simply because the British specifications call for copper, and not because copper has been determined the most efficient protection for iron or steel military supplies. Iron and steel military supplies are being treated by immersion in phosphoric acid solution in the United States, but not because the U. S. Bureau of Standards has pronounced the process most effective. The bureau has recommended zinc in some forms. They do not specify any particular method of applying the zinc, but zinc alone is advised. Zinc on lead, copper or tin over iron or steel is not as reliable as a simple coating of zinc, a subsequent covering of lead has been found beneficial and such coating will withstand very severe salt spray tests. Bituminous paint over the zinc coating has also given very excellent satisfaction. Black nickel should be deposited over zinc to be effective as a protective coating. Nothing is gained by nickling over zinc except a finish which will remain brilliant for longer period, the durability of the coating is not increased appreciably. The investigations now in progress by the United States Government will no doubt result in the production of a standard rustproof coating for iron or steel and when adopted by the industries the process should actually revolutionize metal finishing with reference to iron or steel products.

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Questions and Answers

Question.—We plate large quantities of small steel stampings, nuts and washers, in a mechanical plating apparatus. For some months past the deposit has been more or less unsatisfactory and although we have increased the metallic strength of the nickel solution the results obtained are very inferior. The current is apparently all right as the metal portions of the cylinder in which the goods are processed become very heavily coated with nickel during one day's operation. The goods being plated acquire a dark color and do not finish bright and white as formerly. Our plater requests your advice regarding the condition.

Answer—It is quite evident that your mechanical plating machine has become very thoroughly saturated with metallic salts and we venture to say the metal portions of the rotating portion of the machine are also heavily coated with nickel. If this be true and the nickel deposit has spread over the wooden surface of the inside of the cylinder, procure a long sharp well tempered cold chisel and a hammer and remove the nickel coating from every portion of the cylinder. Be very thorough in the cleaning. If the contact chains or drops are thick with metal, replace with new contacts, brush out all dirt or chips and allow the cylinder to remain unused in the open air for at least 48 hours, in order to dry the portions where metal had formerly covered the wood. With a nickel solution prepared from 50 per cent. double nickel salt and 50 per cent. single nickel salt, with the addition of about 2 oz. magnesium sulphate and 3 oz. boric acid per gallon, you will find no difficulty in producing beautiful white dense deposits by the use of the old cylinder. Do not allow the nickel to accumulate heavily on the cylinder either inside or outside and keep the cylinder out of the solution except when loaded and in operation. If the cylinder is composed of mahogany and bakelite, it should operate satisfactorily, if kept clean, until actually worn out by action of metal goods in motion during operation of plating.

Question—I have been trying to speed up my nickel solution. I secured nickel anodes which are about 96 per cent. nickel, then added nickel sulphate to my old double salt solution until the hydrometer registered 13 degrees Be. I could operate the solution cold with about 8 amperes per square foot of cathode surface and obtain very good results but at 10 amperes per square foot I obtained badly pitted deposits. I therefore heated the solution and am now getting better results but the solution is rapidly losing metal and I find that the anodes are not softening as quickly as they should. Do you consider the 96 per cent. nickel anode too hard, if not, why should they not feed the solution better? Should it be necessary to make frequent additions of nickel salts to a solution such as I have described?

Answer.—Your difficulty is one quite common among platers who undertake to employ nickel anodes of high percentage of nickel in solutions composed of sulphates only. Sulphates are rather poor corroding salts, when regarded with respect to their action on nickel anodes in a plating bath. There is no question as to the superiority of the purer nickel anode over the anode of lesser nickel content. The solution equipped with 96 per cent. nickel anodes must contain some salt which will corrode or attack the anode and facilitate proper disintegration. The corroding salts which are usually employed are magnesium chloride, ammonium chloride, nickel chloride or sodium chloride. Of these, nickel or ammonium chloride are to be preferred. The point to be remembered is, that a chloride is necessary in some form, 2 oz. per gallon is usually quite sufficient. It is good policy not to increase the proportions unnecessarily when solutions are used mainly for plating steel or iron owing to the tendency to promote conditions favoring early decay of the ickel coating through rust. Many platers use only magnesium sulphate and boric acid, with about ½ oz. of chlorides per gallon and secure excellent results. The voltage required for such baths is usually greater than voltage required for baths containing more chloride. If chlorides are present in the nickel bath in proper quantities, the anode will begin to show effect of electric current in less than 10 hours' operation. The solution should remain practically unchanged in density as long as the anade surface is maintained at least one-third greater than the cathode surface usually plated in the bath. Additions of sulphuric acid may be necessary at intervals, depending on speed of deposition and volume of work processed, also upon the thoroughness given the rinsing operation prior to transferring articles to the plating solution.

Question—Can you inform me as to the average cost of welding nickel anode scrap by the oxygen-acetylene process? I understand this method is a practical one and permits useless pieces of anodes to be almost entirely used up in the plating tank.

Answer.—The cost or rather the economy of the oxy-acetylene method of salvaging scrap nickel anodes depends very largely upon the character of the scrap. Sound metal of reasonably large size will prove very satisfactory, and can be welded at approximately the following cost for gas and labor: 29 pounds nickel anode scrap in seven pieces were welded in three hours at a cost of $1.35 for labor and 75 cents for gas. Scrap before welding worth 24 cents per pound. Anode after welding worth practically as much as new anode or 60 cents per pound; difference equals 36 cents per pound; 29 pounds at 36 equals $10.44. Cost of operation equals $2.10 or less than 10 cents per pound. Actual saving by welding process equalled $8.34. Spongy scrap should not be welded. Use plenty of filler, small thin pieces being most economical for the purpose. From three to seven pieces can be welded into each anode nicely.

Question—I wish to inquire the best method of adding sodium cyanide to a copper solution. I have been hanging about ten pounds of the solid salt in the tank when needed. My bath is nearly 300 gallons in volume and is used hot.

Answer—If you dissolve the cyanide in the copper solution when the latter is quite hot the result is a loss of cyanogen, the actual property which is required in the solution. We would advise feeding the copper bath from a stock solution of cyanide. Secure a 15 or 20 gallon stoneware crock and fill three-fourths full with cold water in which place 20 to 30 pounds of lump cyanide and allow to dissolve slowly; stirring occasionally will assist complete solution. Add from 1 gallon to 3 gallons of this solution to the copper bath when required. Stir copper solution after each addition, which should be made at close of day's work and after solution has become comparatively cool.

Question—My brass solution has recently shown a sluggishness of action. Deposit forms very slowly and is not of good color. Hydrometer registers 23 degrees Beaume, and additions of metallic salts or cyanide do not remedy the conditions.

Answer—Do not add anything more to the solution. Remove approximately half of the solution to some container and fill the plating tank with clean water; stir well, allow to settle and proceed to plate. Your bath is too dense for practical commercial purposes; a density of 12 to 15 degrees Be. will permit of more rapid deposits and better color. Possibly you have been adding cyanide too frequently. Try operating for longer periods between additions.

Question—Do you advise the use of the metal cyanides for mechanically operated plating baths?

Answer—We do not advise metal cyanides for motion plating. Carbonates will produce better results with less difficulty. Do not use the electrolyte too concentrated, about 2 or 2½ oz. of metal per gallon is sufficient; there is no reason for excessive content. Ammonium sulphate acts as a very satisfactory brightener. A very good brass solution for motion plating consists of: Cyanide of sodium, 10 oz.; copper carbonate, 6 oz.; zinc trisalyt, 6 oz.; water, one gallon.

Question—How may we remove light rust spots from steel without impairing the brightness of the surface? The article is for the militia and during the warm weather we have experienced great difficulty in preventing the formation of rust. We have thousands of these pieces to lacquer and find all are more or less rusty. Your assistance will be appreciated.

Answer—Prepare a solution of oakite platers' cleaner by using 4 oz. of the O. P. C., and 4 oz. of oakite No. 2, per gallon. Use the solution at boiling point and an electric current of 6 volts. From 1 minute to 3 minutes will suffice. Rinse and pass through strong cyanide solution and immerse in the oakite solution, remove and dry in air without rinsing; wipe with coarse cloth before lacquering. Immersion in the oakite solution will prevent rusting of such parts. You may prefer to rinse in clean hot water and dry with compressed air rather than wiping with cloth.

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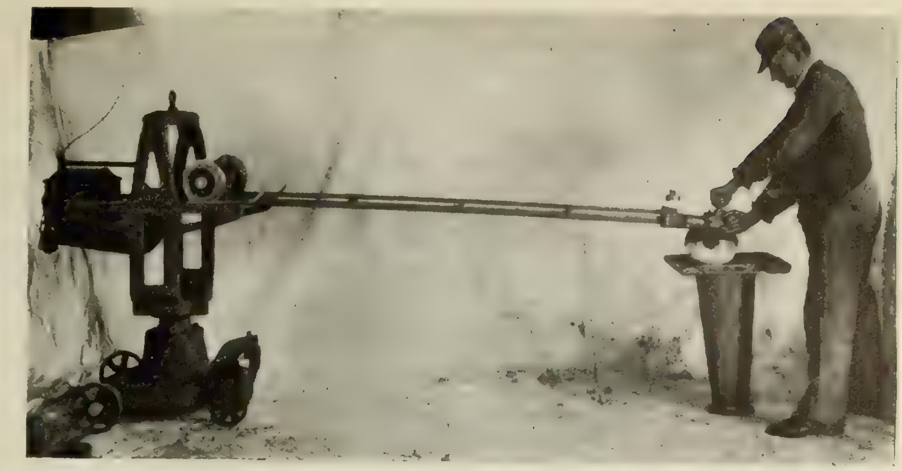
PORTABLE RADIAL GRINDING MACHINE

The Mummert Dixon Co., Hanover, Pa., have bought out a portable radial grinding machine. The machine is primarily intended for general light grinding and buffing work, and the wheel can be raised as high as a man can reach or brought down to the floor, in addition to being turned into any position between a plane at right angles to the floor and one parallel with it, as well as having a slight longitudinal movement.

The machine is a self-contained unit and is readily portable. The grinding wheel, which is 8 in. in diameter, with a 1 in. face, is driven by a motor mounted at the rear end of the tubular arm. This motor, which receives its supply of current from an adjacent lighting socket, is coupled to a shaft running through the tubular arm to a set of hardened steel spiral gears in the head. These gears are enclosed in an oil tight gear and increase the speed from 1,800 to 2,800 r.p.m. The head, arm and motor are carried on a two-wheel ball-bearing trolley, which rolls back and forth on a steel track for a distance of 30 inches. A rack and pinion on each side of the carrying frame is relied upon to keep the trolley in alignment. The motor tends to balance the head, and as it is mounted below the center of the trolley shaft, keeps the whole weight in equilibrium when the workman releases his hold. The bolster of the frame carrying the trolley is mounted on the upper end of a trunion which turns in the base. In this way the arm and the grinding head can be turned entirely around the base, thus giving a full radial grinding machine. It is also possible to twist or turn the head completely around so that the top, either side or bottom of a casting can be ground.



PORTABLE RADIAL GRINDER

When the machine is being moved the trolley can be locked in the middle of the frame, and by inserting a lock pin the bolster can be locked to the base so that it will not turn radially. This arrangement, it is pointed out, will be found advantageous when the machine is being moved over the floor, since the arm can be used as a guide, similar to a waggon tongue.

In addition to the machine illustrated two larger sizes are built. One of these is designed to mount a wheel 14 in. in diameter with 2 in. face, while the other will mount wheels 3 in. wide and either 18 or 20 in. in diameter.

THOSE WHO GET PIG IRON ARE TIED TIGHT TO THE GOVERNMENT

Reports received from the various producing points in United States on the pig iron situation are as follows:"

Philadelphia.—Small lots from the Virginia makers are being sold to some of the foundry iron buyers here. Only two cars per customer are now being distributed and sales are being made only after receiving declarations of purpose from the consumers. Delivery will be made after all priority and allocated orders have been shipped.

Boston.—Some Virginia iron has been arriving here in the last few days but none of it has ever come into the open market as it has all been directed to consumers' destinations. These customers are on the preferential list and were tied up forty different ways by the Government and only one or two cars for each customer were received. Good progress is being made on onld contracts.

Pittsburgh.—Inquiries for both steel making and foundry iron continue to come forward here in very large volumes but the producers generally continue to withhold making any promises. Rather a new feature here is that many of the producers consider that it would be good policy on their part to make contracts on three months' terms, claiming that that is the period for which the Government regulates the prices.

New York.—Some of the Alabama furnaces have been taking considerable orders here for future deliveries and some of the foundrymen may have thought they were in for fairly good supplies. Later orders, however, have it that instructions from the producers to the agents were to cut down on these orders so they were reduced very materially. All of the iron thus sold was without any guarantee of any kind and delivery is to be made only after all the Government orders are filled.

Buffalo.—There is an inclination here among the furnace men to leave the distributing of their future products to the authorities at Washington as they apparently reckon that the Government people will get it sooner or later. In one case a furnace man here took on 1919 business during the last week but that was from an old customer whose plant is working 100 per cent. on Government orders, and he desired simply for 1919.

to be covered as a matter of preference.

Cleveland.—The demand here for pig iron continues to be very, very heavy and most of the consumers are able to show without any doubt that any iron consigned to them will be used for essential purposes and on this account shipments are going forward quite freely. The call now for iron for steel purposes is simply tremendous and it is thought here that a number of the furnaces that are now turning out pig iron will be ordered in the very near future to switch over to the basing material before the month is finished.

Cincinnati.—It appears almost certain now that the stove makers here will have to curtail their product to a considerable extent as only a few of them have been able to make contracts for iron. The word has been pased along that only those that have contracts calling for the supplying of towns for army purposes will be able to get all the iron they need an dthe others will have a hard time in getting metal that is to be used in the non-essential work.

St. Louis.—The war plants in this district are practically getting all the pig iron they require at the present time. Stove makers and others who turn out specialized lines are feeling the pig iron shortage and in many cases they have been resorting to the use of an unusually heavy tonnage of scrap.

Birmingham, Ala.—The belief is expressed in some quarters here that those who have been anticipating an increase in production of pig iron are going to be disappointed. Inquiries are coming in very rapidly and it would be a very easy matter to sell the entire product claim that in this way they are being eliminated from the transaction. Reports from American points would also seem to indicate that there is a very acute situation in the sheet steel markets. Many of the salesmanagers for the large concerns know quite well that the jobbers are in dire need of all grades of sheets. The jobbers are lo wbecause supplies to them have been curtailed very materially during the last 60 days.

Other reports claim that in the Pittsburgh district the mills are showing a further decrease in sheets. It is estimated there that the output does not exceed 55 per cent. of the capacity.

Report from Chicago claims that the extreme heat during the past fortnight has had some effect in reducing the output of the sheet mills.

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SHORTAGE OF LABOR MAKES IT HARD TO SECURE SCRAP NOW

In connection with the scrap metal situation in many of the large points in the United States it would appear that the labor shortage is one of the biggest factors interfering with the sorting and securing of supply for the foundrymen. Reports from the various centres are as follows:—

New York.—A great many of the larger yards here have been forced to curtail operations on account of the labor shortage. Cast scrap remains in particularly heavy demand with the bulk of this material going to local foundries. Reflecting the continued sharp demand for cast scrap are the higher prices now being paid for stove plates and grate bars.

Boston.—There is a large volume of trade moving but labor is holding back a good number of the contracts and causing some serious delay in the filling of them. It is a safe estimate to say that in some weeks the yards are unable to handle any more than 50 per cent. of their work, while at the outside 60 per cent. efficiency has been about the normal figure during this sommer.

Philadelphia.—Small lot trading seems to characterize the scrap situation here, as it seems to be very, very difficult to locate any large tonnages. Borings and turnings are being eagerly sought by blast furnaces to increase their output of pig iron and reduce the coke consumption. The labor situation is also a very acute one here, although in some cases it is pointed out that the yards that are having trouble in securing men are the yards where they are not paying sufficient wages. Several reports have been circulated here to the effect that the Government intends to commandeer all the available scrap, but this report is denied almost as quickly as it is put in circulation.

Pittsburgh.—The stocks of scrap in the yards of dealers here are reported to be very low and in some cases entirely exhausted. Large orders are not coming into the yards here at all, as it is explained in many cases all the scrap is being used in the district where it originates.

Buffalo.—The opinion of many of the large scrap dealers here is that the labor problem is the biggest thing they have to go up against at the present time. Not only are the yards handicapped by the lack of men but the consumers say that they have not sufficient help to handle the scrap when it comes to them. Many of the dealers are not able to classify and sort the stock as it comes to them and because of this they are not able to pass it on quickly to the trade. In fact some tonnages of scrap have been refused in this locality lately because there is not the labor supply to deal with them.

Cleveland.—Heavy melting melting steel is in particularly heavy demand here just now but the supply is no better than before. There appears to be a very large stock in the yards of some of the dealers but is of a miscellaneous character and requires a very great deal of handling and sorting of a more or less skilful character before it can be placed on the market. Some of the dealers say that with a new 25 per cent. increase in freight rates they are losing money on contracts that were figured on a rather narrow margin.

St. Louis.—One thing that is very noticeable in the scrap supply situation here is that railroad offerings are becoming very scarce. In fact in some cases they have almost reached the point. This week there were hardly any lists at all from the transportation companies and it is not likely that any will be sent out in the near future. Since the Government took control of the railways there is a tendency as a matter of policy on their part to sell all scrap direct to the consumers, and dealers

SCIENCE AND BUSINESS

In several British industries, native raw materials are now being utilized where before the war such materials were imported from the continent simply because the manufacturer did not happen to know that ample supplies of the same were at his very door, a fact of which he would have been informed had he consulted competent scientific authorities. This is well illustrated in the case of one of the largest steel corporations of England which, until 1914, had been importing from Austria, through a German firm, a certain material for lining its converters. As time wore on, and the supply diminished, complacency gave place to anxiety. Finally, the directors decided to call in scientific advice. They were referred to the geologists who informed them that a bounttiful supply of the material in question was available in the immediate vicinity of their own plant. The information was acted upon, a shaft was sunk at no great distance from their furnaces, and, as a result, the company is now mining in sufficient quantities on its own account the material formerly imported.

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As is well known, German dirigibles are equipped with wireless telegraphic apparatus, but there has always been a certain amount of speculation as to how the scarcely perceptible signals can be heard in the midst of the noise due to the motors and the displacement of the air. According to a German technical publication quoted in La Nature, a special method is in use. The high frequency oscillations of the receiving station act on an Einthoven galvanometer. The plant recalls the prismatic sight. Underneath is a small electric lamp, the light of which falls on a narrow slit, ordinarily covered by the galvanometer string. The string is in an intense magnetic field. When the receiving current passes, the string deviates, thus allowing the luminous ray to be perceived. The observer at the sighting device can thus read the signals transmitted, in dots and dashes, in the form of short or long light-rays projected by the illuminated slit.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	28 00
Copper, electrolytic	28 50
Copper, casting	28 00
Lead	8 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	82 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	22 50
Copper, heavy	22 50	22 50
Copper wire	22 50	22 50
No. 1 machine composition	22 00	21 50
New brass cuttings	16 00	14 00
No. 1 brass turnings	15 00	15 75
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	20 50
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	31 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	20 00	13 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	7 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 47
Solder, guaranteed	0 50
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	8 95
Premier, 10¾ oz.	13 85	9 25
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.50 to $0.54
Copper	.44 to .46
Tin	.49 to .56
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .20
Acid, hydrochloric	.05
Acid, hydrofluoric	.11½
Acid, nitric	.13
Acid, sulphuric	.05
Ammonia, aqua	.20
Ammonium, carbonate	.33
Ammonium, chloride	.90
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.07
Caustic soda	.17
Copper, carbonate, anhy	[illegible]
Arsenic, white	.25
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.30
Nickel ammonium sulphate.	.20
Nickel sulphate	.30
Potassium carbonate	1.65
Potassium sulphide substitute	.20
Silver nitrate......(per oz.)	1.15
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.41
Sodium cyanide, 98-100%	.38
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 6- 9
Tripoli composition	06 to 9-10
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55
Crocus composition	08 to 8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 38
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

TORONTO.—The steel jobbers are finding it harder to fill the orders that are pouring in on them, and they are going to find it harder later on. There is no end of orders, and as may be supposed every firm sending in an order is quite sure that his work is of the utmost importance toward the winning of the war and should be shoved right through Washington and Ottawa and any other centre that has to do with the granting of the license. Washington, in allocating the output of American mills, lumps the portion that shall go to the Canadian users, and tosses that over to the War Board at Ottawa, and it is then up to that body to go ahead and worry with the Canadian consumers, trying to keep the strictly war business concerns to the front. The further this system is put into effect the more trouble there is bound to be, and the harder the work that will fall to the lot of the War Board at Ottawa.

Prices have shown no great tendency to change during the week. The holiday at the week-end has eased matters up a little, although in some cases there are tendencies that prices will move along again soon. From the way matters are moving it looks as though galvanized sheets were due for a higher level. The mills are finding it harder to secure a supply of tre black sheets to galvanize. In fact all the light gauges of sheets are liable to go to higher levels before many days.

There is no improvement in the boiler tube situation especially as it affects the smaller sizes. There is a fair amount of the larger sizes left, but the big demand just now is for the size around two inches.

Scrap Metal Situation

Prices that have been quoted by the dealers during the last week will continue to govern the dealing during the next week or so unless something very unusual turns up. There is always a period of price stagnation around this time of the year, and the only thing that has turned up to interfere with it recently was the trend of copper and brass upwards following the action of the U. S. government in raising the fixed price on copper.

As a matter of fact there is a good deal of scrap passing just now that the dealers are not touching in the transaction. One of the largest dealers in this district stated to-day there were many of the mills with a good supply of heavy melting scrap on hand, and he did not know where it had been secured. There is only a fair volume of business moving. Scrap is not being located easily, and in many cases those who secure it in the first place are forced to go farther afield for it than formerly, and in this way they want more for their work. The labor problem not only in the scrap yards but in the premises of some of the big scrap sources keeps a lot from the market. There is not the help available to properly sort the material, and so it is held back.

No definite word has been given out regarding the disposal of the electric line from London that is passing into the hands of the scrap merchants. There is quite a bit of interest locally in the deal and it is known that several of the dealers have made a number of trips to London to look the proposition over. It ought to be definitely known in the next few days what will be done. Foundries continue to inquire for good machine scrap to ease off on their piles of pig, especially if they are not in a line that will be guaranteed a supply by the War Board at Ottawa.

PLATING CHEMICALS CONTINUE TO ADVANCE IN PRICE

War conditions continue to hit the foundry trade and the difficulty in obtaining supplies is increasing daily Buyers are experiencing some anxiety regarding their future requirements. The general market tendency is reflected in the quotations for the current period, some of these prices showing an advance of 50 per cent.

Boracic acid, selling a month ago for 15 cents is now bringing about 26 cents per pound, and in 100 pound lots the price is 20 cents per pound. Nitric acid is now quoted at 13 cents, an advance over last month of 3 cents per pound.

Ammonia products are a feature, and advances are quite excessive. Aqua ammonium has advanced from 8 cents to 20 cents per pound. Carbonate of ammonium shows an advance over last month of 17 cents, the current quotation being 33 cents per pound. Chloride shows a very sharp advance, having risen from 11 cents to 90 cents per pound during the past five weeks. Nickel ammonium sulphate is now bringing 20 cents per pound, an advance on the month of 8 cents per pound.

Caustic soda at 17 cents per pound shows an advance of 10 cents per pound during the past month. White arsenic is selling at 25 cents, the previous quotation being 12 cents per pound.

Silver nitrate has advanced from 55 cents to $1.15 per oz.

BRITISH TRADE AFTER THE WAR

The reports of several committees appointed in 1916 by the British Board of Trade to consider the position of the various trades after the war, with reference to international competition, were published in London, England, last Thursday.

The committee on textile trades recommends immediate measures to increase the output of cotton in India, Egypt and the Sudan, and also for the control of the export of Egyptian cotton, in order to safeguard the requirements of the British Empire and its allies, and to prevent any possible leakage to or storage for account of enemy states.

Regarding wool, the committee points out the predominant position of the British Empire in the production of wool for clothing purposes and suggests early conferences between representatives of Australia, New Zealand and South Africa in order to formulate a plan with a view to the fulfilment of the pledges to the allies in the Paris resolution, the safeguarding of British requirements, and the utilization of the wool resources of the Empire as a means for bargaining.

The committee suggests a policy of licenses during the period of reconstruction, with a prohibition of exports to enemy countries for at least one year after the conclusion of peace, and for such further period as may be desirable, while exports to neutral countries would be restricted to wool available after satisfying the requirements of the British Empire and its allies.

Flax and Wool

Regarding flax, the committee says Germany and Austria are dependent on the allies in normal times for three-quarters of their requirements of raw flax. While the allies control over 90 per cent. of the world's production, Russia is the largest producer, but the finest qualities are grown in Belgium and Ireland. The committee recommends measures to stimulate the production of flax in Ireland, Canada, India and other parts of the Empire, and also recommends that the allied countries take great measures to conserve the supply of flax for each other's use in priority of other demands.

Regarding jute, the committee recommends that advantage be taken of India's monopoly in the production of jute to safeguard for Great Britain and her allies the supplies of this fibre, and advises the imposition of an export duty (£5 per ton has been suggested by experts) on shipment of raw jute from India to all destinations, with a total rebate duty in favor of the British Empire, a total of graduated rebates in favor of its allies, and graduated rebates in favor of such neutral countries as may offer reciprocal concessions.

Regarding the textile industry, the committee recommends Government measures which will make the cotton industry of Great Britain independent of foreign sources of supply as regards dyestuffs, knitting needles and other "pivotal articles."

With reference to the export of textile machinery, the committee says the system of priority certificates should be continued for a sufficient period after the war, with a view to giving preference for the re-equipment not only of British textile factories, but also of "those of our despoiled allies."

Special Tariffs

As regards imports of manufactures, the textile committee suggests that a special tariff regime be applied to imports from Germany and Austria-Hungary for such period as may be determined by considerations of national policy. The committee also recommends, with regard to other countries, that a distinction be made between the allies and neutrals in favor of the allies. Thus, as regards silk goods, for instance, a tariff is suggested, in respect of the allies, of 15 per cent. ad valorem, and in respect of neutrals from 20 to 25 per cent., subject to reciprocal arrangement.

In respect of enemy countries, 40 per cent. would be required. The committee further recommends the enactment of anti-dumping legislation upon the lines adopted in the United States. With reference to all imports on which duties are levied the committee says preference should be accorded to British overseas dominions.

Iron and Steel

The committee on iron and steel trades include in their recommendations the following:

That all imports manufactured from products of iron and steel from present enemy countries be prohibited during the period of reconstruction; that ores and minerals necessary for manufacturing iron and steel be admitted free, and that all other materials necessary for manufacturing iron and steel be admitted only in their natural or unworked states.

It is recommended also that no raw materials be sent to present enemy countries from British dominions or colonies or from the mineral or other resources under British control.

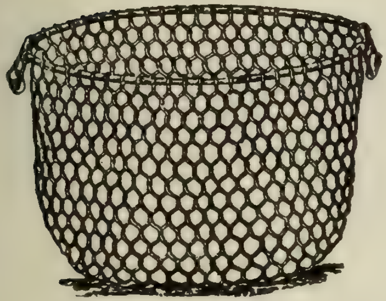
It is recommended further that British ships shall not carry raw materials or manufactured iron or steel from neutral ports to ports in present enemy countries, or to neutral ports for ultimate despatch to enemy countries; that careful Government consideration be given to the question whether ships of present enemy countries shall be allowed to carry goods to or from ports in the British Empire or to coal at any coaling station in the British Empire.

MADE IN CANADA

Headquarters for

Foundry Facings and Supplies

Highly Serviceable Foundry Ladles



Charcoal or Coke Basket

A Favorite Brush

Bench Rammer

By buying from the manufacturer you get better service than by buying through most agencies, because the manufacturer is invariably keener to serve you—and serve you right.

A few of our lines:

CEYLON PLUMBAGO No. 101

There's no better Facing used anywhere than this high-grade "Hamilton" product. If you are not using it, give it a trial.

CEYLON PLUMBAGO No. 206

is without equal for general machinery castings.

BLACK CORE COMPOUND

is guaranteed 100% pure. Users highly recommend it.

PARTING

bring customers back for more and more. Always equal to the severest test. Ask for sample.

SPECIAL STOVE PLATE FACINGS

is backed by our experience of a quarter century. It is perfect facing. You should use it.

Always well stocked for quick deliveries.

The Hamilton Facing Mill Co., Ltd.

Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

TRADE GOSSIP

Rent More Room.—The John Inglis Co., Ltd., have rented the foundry on Bathurst street, formerly operated by the Bertram Engine Co., and are running it in conjunction with their plant on Strachan Avenue, Toronto.

The A. R. Williams Co., of Toronto, have purchased the Dominion Bronze Co.'s premises at Preston, Ont., which company has been in liquidation, and which has been indebted to the Town of Preston for some $10,000, being deferred annual payments and interest.

Manganese Imports.—Further restrictions on the importation of manganese ore were announced by the U. S. War Trade Board. Importation of the ore from Asia and Australasia has been promoted as to ocean shipments made on and after next July 20. The board also announced that flaxseed and linseed have been placed on the list of restricted imports.

Increased Capital.—Notice appears in the Ontario Gazette changing the name of Canadian Hoskins Ltd., to that of Hiram Walker & Sons Metal Products Ltd. The capital is increased from $40,000 to $250,000. The powers of the company are extended to carry on the businesses of foundrymen, wire manufacturers and machinists; and increasing the number of directors of the company from five to seven.

Gananoque, Ont.—The Ontario Steel Products Co. has closed with the United States government for the manufacture of a substantial number of spades and shovels for war purposes. The company is already at work on the new order and deliveries are going forward. It is stated that contracts will keep the company busy until February or March of next year. Other lines of war work are said to be quiet.

Hard on Factories.—Although the order of the Ontario Railway and Municipal Board requiring all Chatham factories to discontinue the use of natural gas went into effect on June 1, local industries which use gas for operating purposes are still on the lines pending the result of the representations which are to be made to the board to further discuss the matter. If the order is not rescinded or some relief granted to the factories of this city it will necessitate the closing of them and several thousand men will be thrown out of work.

Takes Action.—At Hamilton the United Gas and Fuel Co. issued a writ against the Dominion Natural Gas Co., asking, among other things, for an interim injunction restraining the defendant gas company from taking its threatened action in cutting off the gas supply on July 31. The plaintiff company also seeks unstated damages for alleged wrong and malicious conspiring with intent to injure the plaintiff company by diverting the natural gas agreed to be supplied under the contract to the plaintiff company, to distributing centres in Brantford, Paris, Galt and other towns.

Raised the Wages.—By a notice posted in the smelter at Grand Forks, B.C., the Granby Company told its employees that it had advanced the wages of its employees 25 cents a day. The advance is said to be the result of the advance of the price of copper from 23½ cents to 26 cents a pound. The men now receive $1.25 a day above normal wages, which is based on copper at 16 cents. Although, it is pointed out, copper has been only 23 cents during the past year, the Granby Company has paid its employees on the basis of 24 cents.

New Montreal Firm.—The Union Engine and Machine Works, Ltd., has recently been organized to manufacture all kinds of general machinery and machine tool accessories. The company has acquired the ground floor of a three storey brick building with a floor space of about 8,500 sq. ft., at 344 Delorimier Avenue, Montreal. Installation of equipment was commenced about the first of June and actual operations were started about a month later. Those interested in the new Company are W. Chennery, H. Hill, Geo. Wheller and Chas. Moore.

Prices of Coal Fixed at the N.S. Mines.—Announcement is made by C. A. Magrath, fuel controller, that the prices of coal at the Nova Scotia coal mines have now been adjusted. Before these prices were fixed the fuel control auditor made a careful audit of the books of the various coal companies and a detailed report of each case was submitted. The Fuel Controller also secured the services of some of the foremost mining men in the United States in order to have an independent, technical investigation made. Accompanied by Mr. Magrath these gentlemen recently concluded a personal survey of conditions in the Nova Scotia mining fields.

ENGINEERING

Owen Sound, Ont.—The Booth Fishing Co. contemplates the enlarging of docks and the building of a freezing plant and warehouse.

Brantford, Ont.—The Motor Trucks, Ltd., are building a $12,000 brick boiler house, and have let the roofing contract to Turnbull & Cutcliffe, Brantford.

Port Colborne, Ont.—The International Nickel Co. of Canada began to treat matte at the new refinery at Port Colborne recently. A large quantity of matte from the Copper Cliffe smelter has been shipped to the refinery, and supplies of all kinds are now on hand, and one furnace is in operation.

Niagara Falls, Ont.—Niagara Falls has landed a new industry in the National Abrasive Co., of Boston. Construction of the plant will begin at once. The company located a branch at Hamilton, but not being able to get five thousand horse-power needed, had to sell out there, and the Ontario Hydro has promised them the needed power in this city. The new plant will be in operation by November.

Toronto, Ont.—A coal shed owned by the Connell Coal Company, situated on the Old Fort road south of Bathurst street bridge, has been destroyed by fire. The loss, as estimated by officials of the company, is in the neighborhood of $12,000, which includes the structure, a thousand-dollar motor and the coal elevating machinery.

MUNICIPAL

Brussels, Ont.—A new cement water tank, 12 by 12 feet, for fire protection purposes, is to be built near the Ament factory, North Turnberry street. The council is asking for tenders.

St. Thomas, Ont.—Unless some other means of obtaining the necessary energy is obtained, a number of St. Thomas industries will find it necessary to either close up their plants or install steam power in the fall of this year owing to the great shortage of Hydro-Electric power. It is said that at the present time, despite the order from the controller that no more industries, buildings or stores be supplied with hydro, there are still a number, on the plea of absolute necessity, who have been added to the already large list of users in the city, which means that when the order for cutting down on the amount of power used in this district comes, as it inevitably will, according to local hydro officials, these industrial concerns will either have to install steam or close up.

PERSONAL

J. A. Burnett, electrical engineer, Grand Trunk Railway System, has received an appointment as technical assistant to the British War Mission, Washington, D.C.

James C. Wardrop, engineer on the staff of the Department of Works, Hamilton, Ont., has resigned, and will in future be associated with F. R. Warren, architect.

A. F. Chilcott has been appointed Montreal district manager of the Vanadium-Alloys Steel Co., Pittsburgh, Pa., manufacturers of "Red Cut Superior" high speed tool steel. Mr. Chilcott's offices will be at 512 Dominion Express Building.

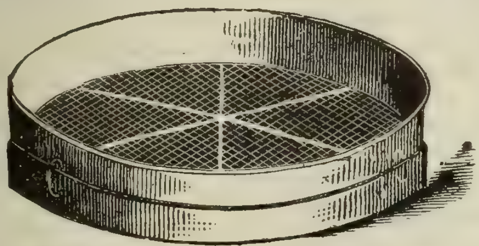
INCORPORATIONS

Incorporation is granted the North Light Motor Co., Ltd., to buy, sell and deal in gas engines, and motors, steam engines and electrical motors, and carry on business as founder, steel manufacturer, etc. Capital $50,000. Incorporators C. .O Peters, A. H. Millar, O. Hamilton ,E. Wegenast and A. M. Gauntly. Head office at New Hamburg, Waterloo Co.

Incorporation is granted to Wentworth Mfg. Co., Ltd., to manufacture and deal in articles of all kinds composed in whole or in part of metal; to carry on the business of a foundry and machine shop and to construct, manufacture and deal in machinery, appliances, implements and apparatus of all kinds; to carry on the business of smelters and refiners, etc. Capital stock $300,000. Incorporators C. D. Dyke, R. G. Brownlee, E. W. McNeill, W. E. Eckardt, S.

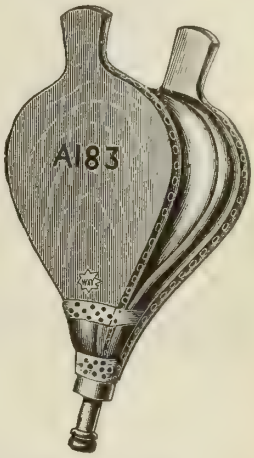
FACINGS

Foundry Supplies and Equipment



Riddles of all meshes in Brass, Galvanized and Steel

Coke Forks in different tines



Bellows with the best of leather and workmanship

Shovels in both Split and D-Handle

Morgan English Crucibles. All sizes carried in stock

MORGAN'S CRUCIBLE
THE MORGAN CRUCIBLE COMPANY
BATTERSEA
LONDON
TRADE MARK

Whiting Cupolas and equipment

The Dominion Foundry Supply Co., Limited

"Everything for the Foundry"

TORONTO MONTREAL

If any advertisement interests you, tear it out now and place with letters to be answered.

H. Young, D. I. Finagin and G. M. Bell, Head office, Toronto.

New Incorporations. — Incorporation has been granted to the following joint stock companies: Lymco Corporation, Limited, Montreal, capital $300,000; Canadian Home Canning Company, Limited, Montreal, capital, $50,000; Peterson Fruit Company, Limited, Montreal, capital, $25,000; Canners' Seeds, Limited, Wellington, Ont., capital, $100,000; Canadian Refractories, Limited, Montreal, capital $20,000; the Golden Wonder Mining Company, Limited, Toronto, capital, $100,000; the Sherbrooke Business Corporation, Limited, Sherbrooke, Que., capital, $49,000; N. C. Polson Company, Limited, Montreal, capital, $300,000; Toplis & Harding, Limited, Montreal, capital, $300,000; Globe Electric Company of Canada, Limited, Winnipeg, capital, $100,000.

CATALOGUES

Grinding and Polishing Machines.—St. Louis Machine Tool Co., St. Louis. Two circulars. The first illustrates and describes the Western line of grinding machines which are made in 11 different types. Illustrations of the various accessories that can be supplied are presented also. The other circular points out the advantages of the special type of ball bearing used with the company's polishing machines. The different machines making up the complete line are illustrated, and a condensed table of specifications is included. There is practically no text in the circular, reliance being placed upon the illustrations to tell the story.

RAILWAYS

Montreal.—The Board of Trade here received from the Dominion Board of Railway Commissioners an important order with regard to freight rates in Canada, authorizing an increase in transcontinental freight rates by 25 per cent. on so-called commodity rates on and after August next. New tariffs are now being printed embodying these rates by the C.P.R., G. T., G.T.P., and C.N., and these will be issued about the middle of the month This increase, coming in addition to the 15 per cent advance granted in March last, will mean a total increase of 40 per cent. on rates for commodity freight from Montreal and Eastern Canadian points to Pacific ports within the last five months.

◆

EASTERN SPRUCE FOR AEROPLANES

So great is the demand for airplane spruce by the Allies that eastern as well as Sitka spruce is now being used. Canada has large resources of eastern spruce, which has hitherto been used mostly for the manufacture of pulp, paper and lumber, and the British War Mission is at present trying to secure in eastern Canada as large an amount as possible of the grades suitable for airplane manufacture.

Eastern spruce has for some time been used for airplane construction in the United States, although only a very small percentage of this timber is sufficiently clear for this purpose. Tests made by the United States and Canadian governments show that where material of suitable quality can be found, this species serves admirably for airplane construction and may be expected to supplement the supplies of Sitka spruce from the Pacific Coast, which are only now beginning to approach adequate proportions.

The timber for use in airplanes has to be sawed parallel to the bark, instead of parallel to the axis of the log, as is done for lumber. In this way, straight-grained boards are obtained, having the highest possible percentage of material free from knots and possessing a maximum of strength.

◆

The effect on orifice and weir flow of slight roundings of the upstream edge has formed the subject of experiments by Mr. Jacob O. Jones, and the results were given in a recent issue of the Cornell Engineer. Briefly, the author concludes that the effect on orifice flow of slight rounding of the upstream edge is independent of the head; the percentage increase in the coefficient of discharge varies inversely as the diameter of the orifice, and directly as the radius of the rounding of the edge; the percentage effect is considerable even for very small orifices, amounting to 1 per cent. for a rounding of .001 inch on a ⅜-inch orifice, and 1 per cent. for a rounding of .004 inch radius on a 1⅜-inch orifice.

SIMPLICITY DESIGN DURABILITY WORKMANSHIP The Ford-Smith Machine Company SIMPLICITY DESIGN DURABILITY WORKMANSHIP

Machines of Highest Grade for Shop and Foundry

Ford-Smith Grinders—

A few of our lines are

General Purpose Shop Grinders.
Floor Grinders (all sizes).
Water Tool Grinders (Belt or Motor Driven).
Bench Grinders.
Polishers and Buffers.
Plow Grinders and Disc Grinders.
Swing Grinders and Special Grinding Machines.

Our Catalog is yours for the asking.

The Ford-Smith Machine Co., Limited
Hamilton, Ontario, Canada

Classified Advertising

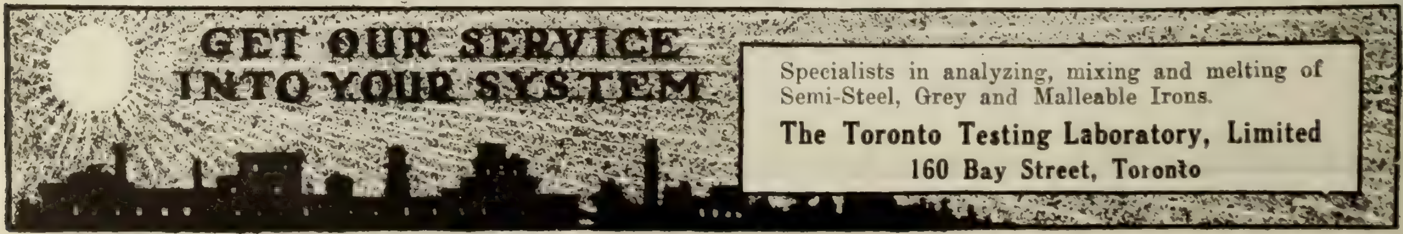
Advertisements under this head are charged at the rate of two cents per word for first insertion and one cent per word for subsequent insertions. Minimum orders $1.

FOUNDRY FOREMAN WANTED—CAPABLE man familiar with small iron and brass castings, prefer man with iron pump experience. State full particulars first letter. Medicine Hat Pump & Brass Mfg. Co., Ltd. (c8f)

FOR SALE—ONE MONARCH No. 275 TILTing Furnace, capacity 700 lbs. per heat. One Rockwell Type Tilting Furnace, capacity 5 to 700 lbs. per heat. One 5,000-gallon oil tank complete with motor operated pump, safety valves, etc. One No. 2 Root Pressure Blower, complete with pipe and fittings. Tolland Manufacturing Co., Limited, Montreal, Que.

WANTED 50-60 TONS OF USED MAULING sand. Apply Box 455, Canadian Foundryman. (c8f)

KINDLY MENTION THIS PAPER WHEN WRITING TO ADVERTISER.



Specialists in analyzing, mixing and melting of Semi-Steel, Grey and Malleable Irons.

The Toronto Testing Laboratory, Limited
160 Bay Street, Toronto

One bag of DIAMOND GRIT or CHILLED SHOT will last as long and do more work than 100 bags of sand

In an eastern foundry six bags of Diamond Grit cleaned 2,000,000 pounds of brass castings.

—in a middle west iron works, 1,000 tons of malleable castings were cleaned at the extremely low cost of $67.20, with Diamond Grit.

—a test in a New England foundry demonstrated that one ton of malleable castings could be cleaned at a cost of less than two cents—with Diamond Grit.

Save time, increase production and eliminate dust by "Shot Blasting" or "Grit Blasting" the perfect metallic abrasives.

Samples free.

HARRISON SUPPLY COMPANY
5-7 DORCHESTER AVE. EXTENSION
BOSTON, MASS., U. S. A.

Lowering the Cost of Getting Orders

THEY were talking about the high cost of getting orders—were Brown and Jones. They were agreed on some things: train service was interfering with ability of salesmen to call on as many as formerly; hotel bills were adding heavily to the weekly expenses of salesmen; congested freight and express service was interfering with quick deliveries; salaries of men were going up; labor of all sorts, as well as materials, was becoming higher-priced.

Then Brown said: "I am giving a good deal of thought to the training of my salesmen. I am endeavoring to make them produce more business—to sell more goods, and to reduce the number of futile calls. I notice that they are giving much attention to this subject in the United States, and that in Canada some firms are paying serious attention to this matter of better salesmanship."

"What are you doing?" said Jones.

"Well, I haven't done a great deal so far, for I am in the initial stages of my studies. But one thing I have learned: it is that my men haven't been analyzing the causes of their failures to make sales. I can't blame them, for I myself haven't troubled myself to dig into this phase of the selling game. Now I am asking myself and my men—Why the failure to get the order?

"I have discovered a good deal. One thing is that my men haven't known enough about the goods they took out to demonstrate them convincingly. This is largely our fault. So we are using time and printed matter to make our men know exactly what they have to offer.

"Another thing we have had impressed on us is that our men haven't been approaching their prospects always in the best way. They have been too keen to sell rather than to serve.

"I saw a thing the other day that is good—by a man named Casson. He said the average salesman's method was 'Talk—Argue—Compel.' As against this, he recommended: Listen—Agree—Oblige.

"What he means is that the salesman must get on the side of the buyer if he is to have best results. And so I am doing something to get my men trained to acquire the point of view of the man they canvass—this first. When a salesman postpones his sales talk until he has won the interest and attention of the prospect, he is in a much more favorable position to put across his proposal.

"I read recently an advertisement of the FINANCIAL POST in which it told of Frank Mutton, President of the International Business Machines Company, in which he said that he has subscribed to THE POST for each of his salesmen in order that they may be well informed about business conditions and affairs in Canada—this as an aid in making sales. The idea, I infer, is to make his men quick to get the point of view of the men they are to canvass—to become possessed of a kind and amount of information which will enable them to make themselves interesting to prospective buyers of time-recording machines.

"Now, I have known Mutton for many years—known him to be a super-salesman. In subscribing to THE POST for his salesmen, I saw one of his methods—secrets, if you like. So I got THE POST myself to see how my men could make use of it for the same objects.

"I have subscribed to THE POST for 4 months at the cost of a dollar per salesman, and I have been having my men report to me in writing just how they are finding THE POST useful to them. They read THE POST with one question uppermost: What item or article in this issue can be used by me to help me make sales?

"I want to tell you, Jones, that I am delighted with the experiment. The minds of my men have been stimulated. They are 'cashing in' on what they read. They relate certain items or articles to certain prospects, and they are approaching their customers with greater confidence, greater art, and with more persistency, born of a surer knowledge of how our product is worth the other man's consideration and purchase.

"My men are bringing in more business, and this offsets the increasing costs of going after business."

* * * *

A VERY suggestive conversation, is it not? The point of its reproduction here: If you think the idea put into operation by Brown (and Mutton who is paying for 50 subscriptions for men in his employ) is worth your consideration, then investigate THE POST for yourself. Instruct us to send THE POST to you that you may investigate it from the angle—What is there in this paper that my men can use to help them "get next" their prospects with a view to making more sales and in quicker time?

So we suggest to you that you sign the coupon below.

Just what does THE FINANCIAL POST aim to do? The answer is: It gives business men information about every important happening in every part of Canada as this happening relates to Business. It follows the various listed and unlisted securities, and gives each week clear and accurate and up-to-the-minute information about them. It tells about the movements and influences affecting such groups of investment interests as Iron and Steel, Textiles, Milling, Pulp and Paper, Transportation, and so on. It has numerous contributed articles of first-class interest and importance. It contains much personal matter—notes and sketches about men of influence or position in the public eye whose doings or sayings have relation to Business. Withal, THE POST is extremely readable. It is edited and prepared by trained journalists—the highest-priced staff of men on any publication in Canada. All this makes THE POST a "different" paper, and a good one. The subscription price is $3.00 (52 issues — Saturdays); or 4 months for one dollar.

The MacLean Publishing Company, Ltd.,
143-153 University Avenue, Toronto.

Send me us THE FINANCIAL POST (weekly, every Saturday). Subscription price of $3 will be remitted on receipt of invoice in the usual way. Have it addressed to

....

C.F. ....

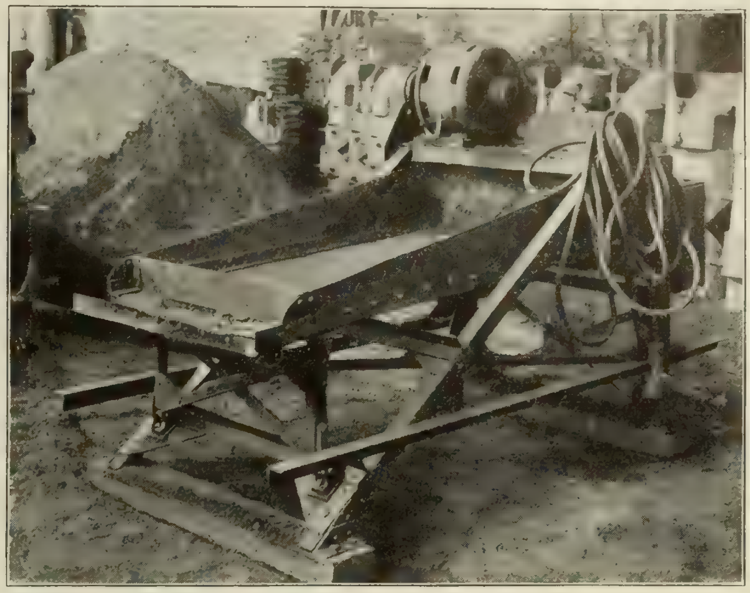
RODGERS ELECTRIC SAND RIDDLE

Saves Labor
Saves Time and
Cuts the Costs

Every Canadian foundry needs the Rodgers Electric Sand Riddle—conditions to-day emphasize the necessity.

The riddle is not designed **just to sell,** but to do foundry work more economically and efficiently. It is extremely moderate in price, considering its merits. Costs just $400 F.O.B. cars, shop, Muskegon, Mich. Electrical driven. If purchaser desires to furnish own motor a deduction of $100 is made. Canadian buyers are required to pay duty.

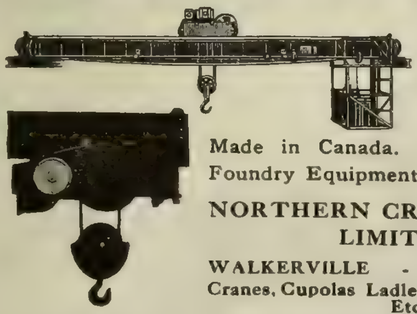
The Machine is strong and durable, and will stand up under any strain. Costs very little to keep up.



Largest foundries in the United States have adopted Rodgers Electric Sand Riddle and it is giving entire satisfaction in every case. Pay Canadian foundrymen to investigate. Write to-day for full particulars.

Rodgers Boiler & Burner Company, Muskegon, Mich.

CRANES



Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS LIMITED
WALKERVILLE - - ONTARIO
Cranes, Cupolas Ladles, Hoists, Tumblers Etc.

IT IS IMPORTANT!

If you have something to dispose of in goods or service that as many buyers as possible get to know you and your product. This can be accomplished through

Canadian Foundryman
143 University Avenue, Toronto

Dependable *Uniform*
CRUCIBLES
McCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.
WRITE FOR PRICES AND LISTS

Trade Mark
Reg. U.S. Pat. Office

ANGULAR GRIT---THE SCIENTIFIC METALLIC BLASTING ABRASIVE

that reduces sand blast costs and conserves labor. ONE TON of ANGULAR GRIT will do as much work as carloads of sand; its sharp cutting points makes it superior to all other abrasives. Write for samples.

PITTSBURGH CRUSHED STEEL CO., Sole Manufacturers
PITTSBURGH, Pa., U.S.A., Established 1888
Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal, Canada.

Trade Mark
Reg. U.S. Pat. Office

Fire Brick and Shapes

We endeavor to maintain a complete stock of highest grades for all purposes

Cupola Block and Circle Brick—the kind so many Canadian Foundries find it pays to use.

See our classified list of foundry supplies in the "Buyers' Directory."

Either from our stock or direct from the plants of our principals—The Stowe-Fuller Company, of Cleveland, Ohio—we can at all time make

Prompt Shipments

Fire Clays and Silica Cement—Silica and Magnesite Brick — no better made.

Have us quote on your foundry requirements.

HYDE & SONS.
MONTREAL, QUEBEC
P.O. BOX 1185

USE KAOLIN

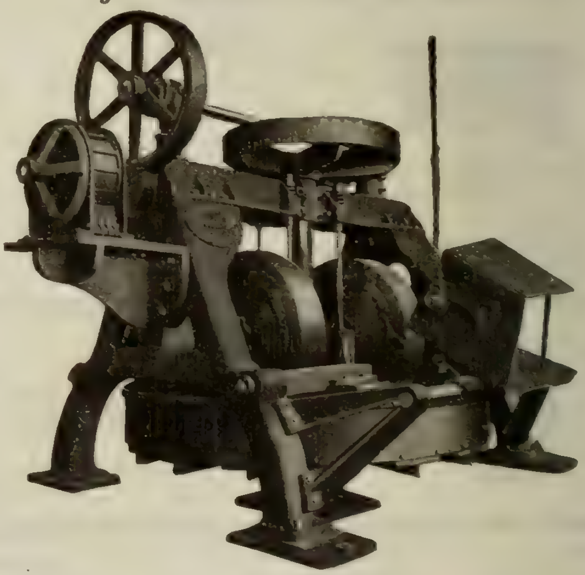
For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

It will save your fire brick and the time of your men.

Whitehead Bros. Co.
Providence
New York
Buffalo

Frost

Wet Pan Sand Mill
for Steel Foundries



The Frost Mfg. Co.
112 W. Adams St.
CHICAGO

"702"
Ceylon
Plumbago

Rillton
Ingot Mold
Blacking

Peerless
Perfect
Parting
Compound

ESSO
TRADE MARK REGISTERED

Rillton
Brass
Cleaner

Esso
Plumbago
Core Wash

No. 702 Pure Ceylon Plumbago
Rillton Sea Coal Facing
"Kantbebeat" Core Compound
"Bull Dog" Core Wash
"Esso" Linseed Core Oil

"All These Brands stand for Efficiency and Reliability"

Bull Dog
Core Wash

Car Wheel
Core
Compound

EVERYTHING YOU NEED IN YOUR FOUNDRY

Esso Cream
Soapstone

No. 440
Mica Core
Wash

The S. Obermayer Company

FACTORIES:
Chicago Cincinnati Rillton, Pa.

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XX
Peerless
Core
Oil

Rillton
Sea
Coal
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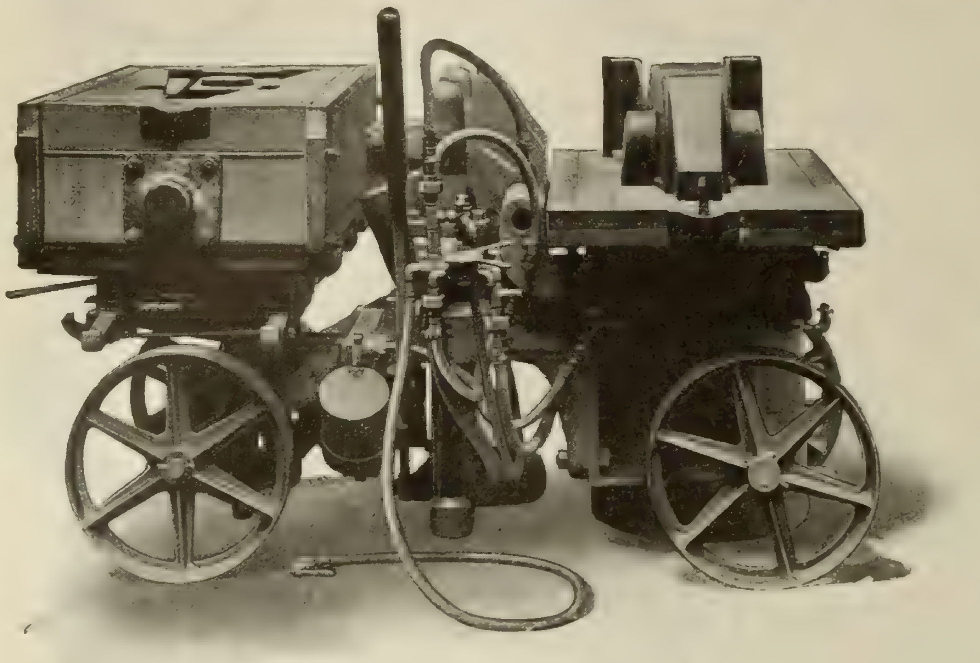
TABOR

PORTABLE COMBINATION SHOCKLESS JARRING ROLL-OVER AND PATTERN DRAWING MOLDING MACHINE



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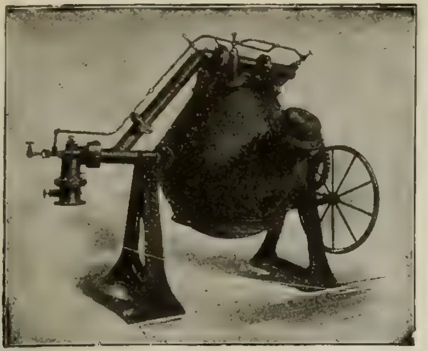

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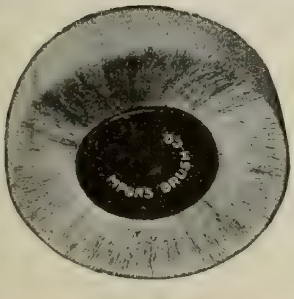

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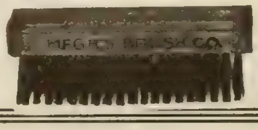

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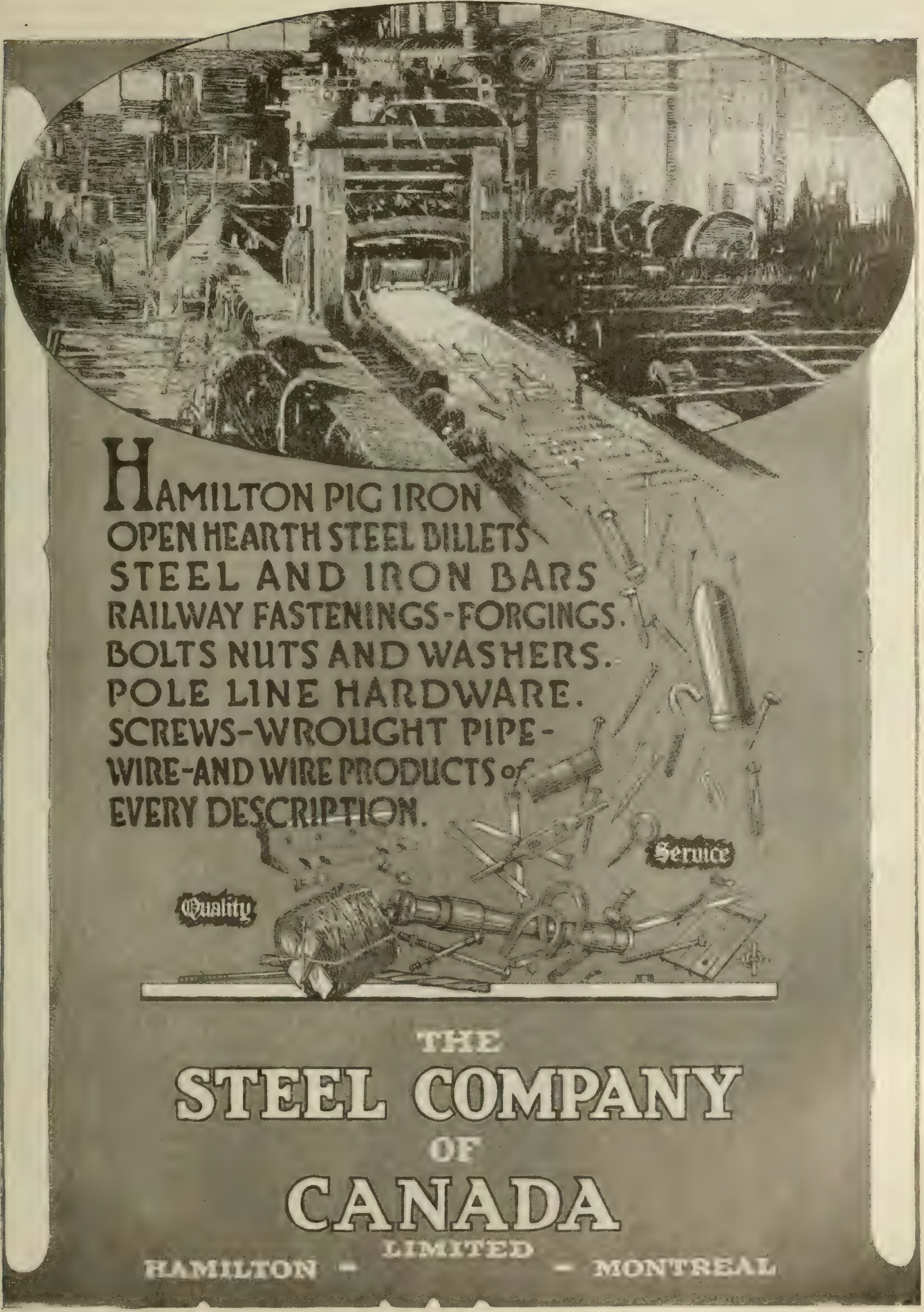

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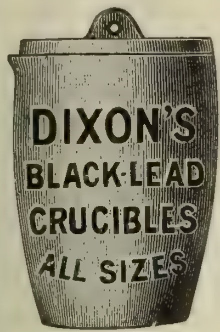

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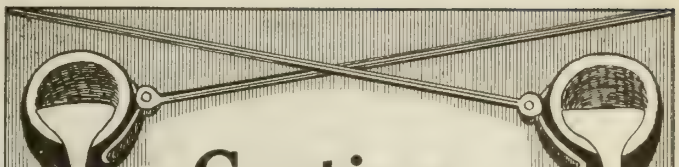

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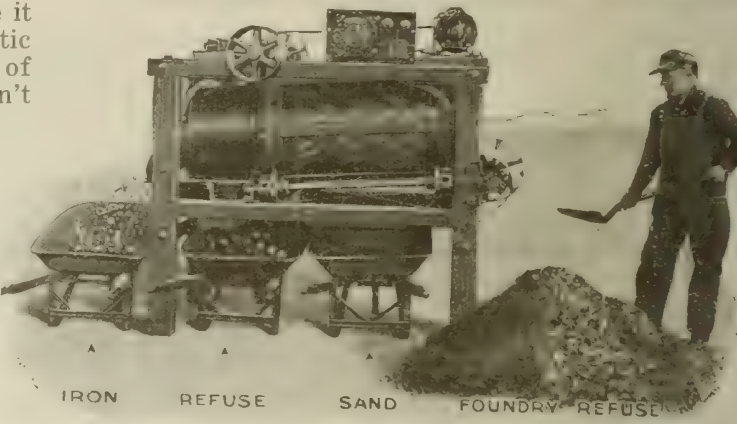

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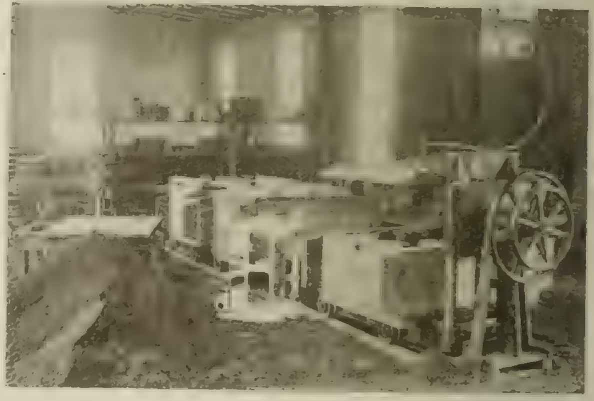

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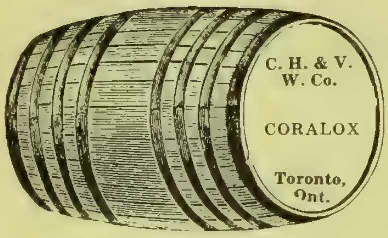

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TORONTO, CANADA

PRE-CONVENTION NUMBER

CANADIAN FOUNDRYMAN
and
Metal Industry News

VOL. IX. PUBLICATION OFFICE, TORONTO, SEPTEMBER, 1918. No. 9

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For All Classes of Foundry Requirements

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with outside or inside latch, made in 10 sizes to suit all classes of work; they are speedy and dust-proof, and are well liked by the operators who use them.

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The Publisher's Page

TORONTO SEPTEMBER, 1918

Week of October 7th Will Be A Big One For Foundrymen

WE know you're busy and that it may be hard for you to get away. We realize that it may cost something in time, thought, effort and money, but if you own or are connected with a foundry that has any size to it at all, it will pay you to attend the American Foundrymen's Association International Convention and the Exhibition of Foundry Equipment to be held under the same auspices.

Milwaukee Week of October 7th

The officials of the Association have assured us that from every point of view the 1918 Convention and Exhibition will be by long odds the best ever.

Representatives of the Iron and Steel Section and the Metals Division of the American Institute of Mining Engineers and also the American Malleable Castings Association will meet at the same time and at the same place. In fact during the week of October 7th there will meet in Milwaukee the greatest body of metal workers the world perhaps has ever seen. These men will meet with one big single purpose—earnest, high and determined—the successful prosecution of the war. Their deliberations cannot help but make for vastly greater efficiency and the result of the conference will be both far reaching and lasting. Every Canadian foundry should have a wide-awake representative at the convention.

THE EXHIBITION OF FOUNDRY EQUIPMENT AND SUPPLIES

Over one hundred and sixty leading manufacturers of foundry equipment and supplies will be represented at the mammoth exhibition this year. You will be able to see the most up-to-date equipment in actual operation and furnishing practical demonstrations. To carefully inspect and study the exhibits will make the trip to Milwaukee a big paying investment. It will prove a liberal education in itself.

And aside from studying and purchasing equipment the trip will do you good. It is a magnificent privilege to be able to mingle for a whole week with foundrymen gathered from all parts of two great countries. You'll get a royal welcome from your friends across the line and you'll be made to feel very much at home. It's a good thing to get the other fellow's viewpoint. If your own perspective is right it will be confirmed and if wrong you'll be able to correct it.

Make our booth your headquarters. CANADIAN FOUNDRYMAN will have Booth No. 60, and you are invited to make it your headquarters to meet your friends, to rest, to receive your correspondence, etc. You will be very welcome. If you wish us to reserve hotel accommodation for you let us know at once, or if you prefer to attend to this important detail it will be advisable to reserve your room immediately.

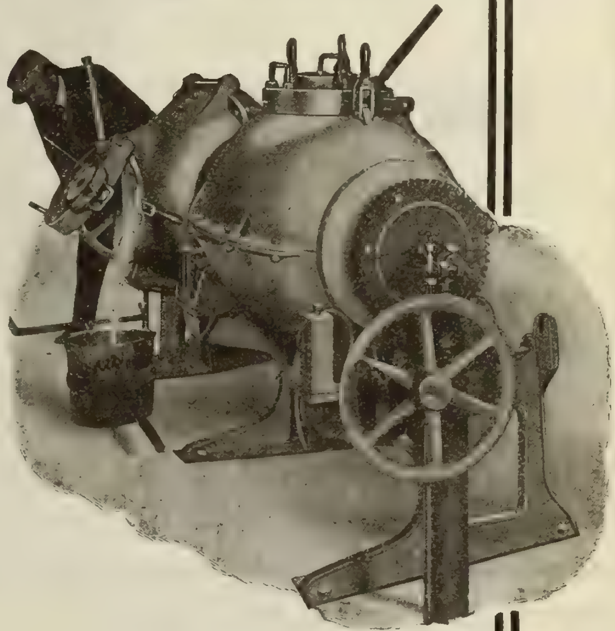
You owe it to yourself—to your business, to your employees, to the "Great Cause" to attend the convention this year. The place—Milwaukee Auditorium, Milwaukee, Wis. The time—October 7th to 11th.

CANADIAN FOUNDRYMAN
153 UNIVERSITY AVENUE - TORONTO
BOOTH No. 60 AT THE CONVENTION

Monarch

Double Chamber Furnace

Reduces copper, brass, aluminum, iron, steel and like metals to molten condition in about one-half the time required by any other furnace —our own single chamber and tilting coke crucible furnaces not excepted. Considered as a fuel saver, it is

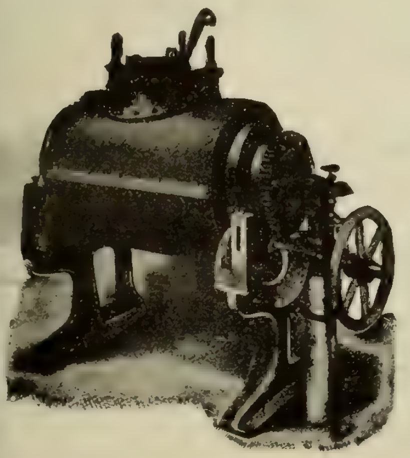


50%
More
Economical

than any other furnace burning oil or gas and air.

In hundreds of foundries this Monarch Furnace has eliminated profitless waiting. With it in use there is no time lost before or after the draw. One chamber can be run off while exhaust heat brings the metal in the other to the melting point.

And there can be no oxidizing. The flame from the one and only burner is not directed against the metal.



Monarch Rockwell Single Chamber Furnace —"Simplex"

Built on the same lines as the Double-chamber Furnace, but without its continuous heating capacity. Still the fastest and best fuel economizer of its kind.

Let us tell you, point by point, the many good features about this furnace. It is really a wonderful combination of utmost efficiency and utmost economy.

Write for the Monarch Catalogue CF9.

The Monarch Engineering & Manufacturing Company

1206 American Building
Baltimore, MD., U.S.A.
Shops: Curtis Bay, MD.

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

To-day When-High Grade Castings Are Desired And In Demand

You should use the very best material which will guarantee results and prove the cheapest in the end.

Our No. 522 Plumbago
No. 510 Plumbago

Stevens' Carbon Dry-Sand Blacking
and King Kore Kompound

have our guarantee back of them and we are willing to ship a barrel for trial, from our Montreal stock.

We also carry a full line of other FOUNDRY SUPPLIES AND BUFFING AND PLATERS SUPPLIES.

Standard Machinery & Supplies Limited
260 St. James St. Montreal, Que.

SLY FOR SERVICE

Do You Tumble Your Castings?

If not—Why not?

Tumbling castings is an automatic process which releases labor for other purposes, and we make mills to do **Your** particular **Work.**

THIS MILL ROOM
is laid out for efficiency—it is clean and sanitary and a great factor in reducing the cost of the finished product.

Do you need SAND BLAST

We make
- **Mills**
- **Rooms**
- **Cabinets**
- **Specialties**
- **Rotary Tables**
- **Pressure Machines**

Iron Cinder Mills
Dust Arresters
Exhaust Fans

CORE OVENS

- **Drawer Ovens**
- **Rack Ovens**
- **Car Ovens**
- **Core Racks**
- **Core Cars**

Brass Cinder Mills
Resin Mills
Cupolas

"See us at Milwaukee" at the Convention.

THE W. W. SLY MFG. CO.

NEW YORK **CLEVELAND, O.** **CHICAGO**

EVERY FOUNDRYMAN, EVERY METAL DEALER, EVERY METAL MANUFACTURER REQUIRES, IN THE COURSE OF BUSINESS, THE ANALYSIS OF SOME MATERIALS.

IT MAY BE THAT THE COMPOSITION OF SOME STEEL, BRASS OR ALLOY IS REQUIRED. IT MAY BE AN OIL, A SAND OR A CLAY.

YOU ARE ANXIOUS AT SOME TIME TO HAVE THE COMPOSITION DETERMINED AND A CLEAR, DETAILED AND PRACTICAL REPORT RENDERED.

SUCH A SERVICE WE OFFER TO THE FOUNDRY AND THE ALLIED TRADES. OUR EXPERT ANALYSTS AND THOROUGHLY PRACTICAL INDUSTRIAL CHEMISTS ARE PREPARED TO SOLVE ANY SUCH PROBLEMS FOR YOU.

THE LARGEST AND BEST EQUIPPED COMMERCIAL LABORATORIES IN CANADA

MILTON HERSEY COMPANY LIMITED

INDUSTRIAL CHEMISTS, ENGINEERS AND INSPECTORS

MONTREAL WINNIPEG

English Moulding Machines

"Jarr" Ramming
"Head" Ramming
"Hand" Ramming

The most efficient on the market.
Well built to suit rough usage.

Write for particulars to the makers.

Britannia Foundry Company

Coventry, England

Turn the searchlight on your foundry costs—

—what is it costing you to mix your core sand?

We can tell you almost to a penny what your cost is—if you're mixing sand by hand.

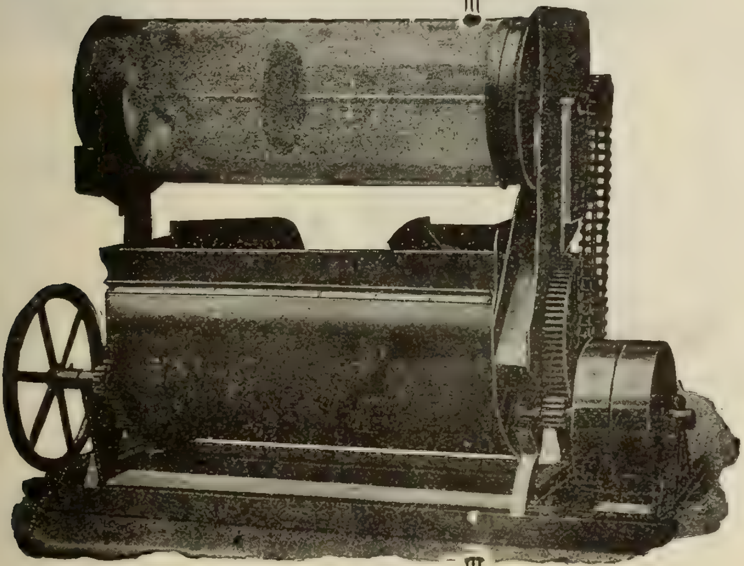
It is about 60% more than it ought to be or need be.

Here is the machine that has entirely displaced hand mixing in more than 1,000 leading foundries in this country—because it cuts mixing costs at least 60% and produces a better mix and saves 10% to 20% in binder.

BLYSTONE
Core Sand Mixer

An unusually simple machine, sturdily built of the best materials money will buy—ensuring you easy operation, low upkeep and operating costs and long wear.

Visit the Blystone Exhibit at the Foundrymen's show at Milwaukee —Oct. 7-11.



It consists merely of an open-mouth drum of heavy gauge steel, in which six powerful steel shovels arranged on a central shaft in accordance with the well known Blystone Reverse Spiral Shovel System produces an absolutely complete and uniform mixture throughout the entire mass of sand. Loading and discharging takes place without stopping the mixer.

Here Is An Offer

If you mix enough sand in your foundry to warrant the use of a machine you cannot afford to pass by the economies which the Blystone Mixer will effect in your foundry—especially in these times of labor shortage and high costs.

We will bear the entire burden of proof and let you try one of these machines in your foundry for 10 days before you decide whether or not you want to buy it.

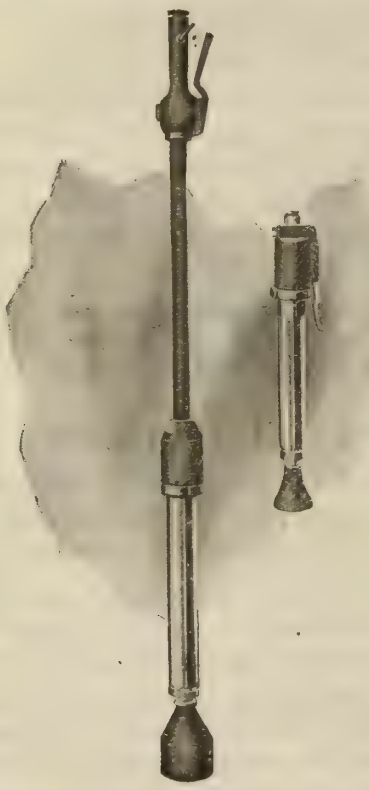
Write or wire for prices. Mixers shipped promptly.

Blystone Manufacturing Co.

1018 Main St., Cambridge Springs, Pa.

Birmingham	Hill & Griffith Co.
Buffalo	E. J. Woodison Co.
Chicago	Scully-Jones & Co.
Cincinnati	Hill & Griffith Co.
Cleveland	E. J. Woodison Co.
Detroit	E. J. Woodison Co.
New York	Wonham, Bates & Goode, Inc.
Philadelphia	Standard Supply & Equipment Co.
Pittsburgh	J. S. McCormick Co.
Toronto	E. B. Fluery

THE "CROWN"
SAND RAMMER



Four times as fast as hand ramming.

More uniform work and no overweight.

No trouble from dust or dirt.

Simple to handle and easy on air.

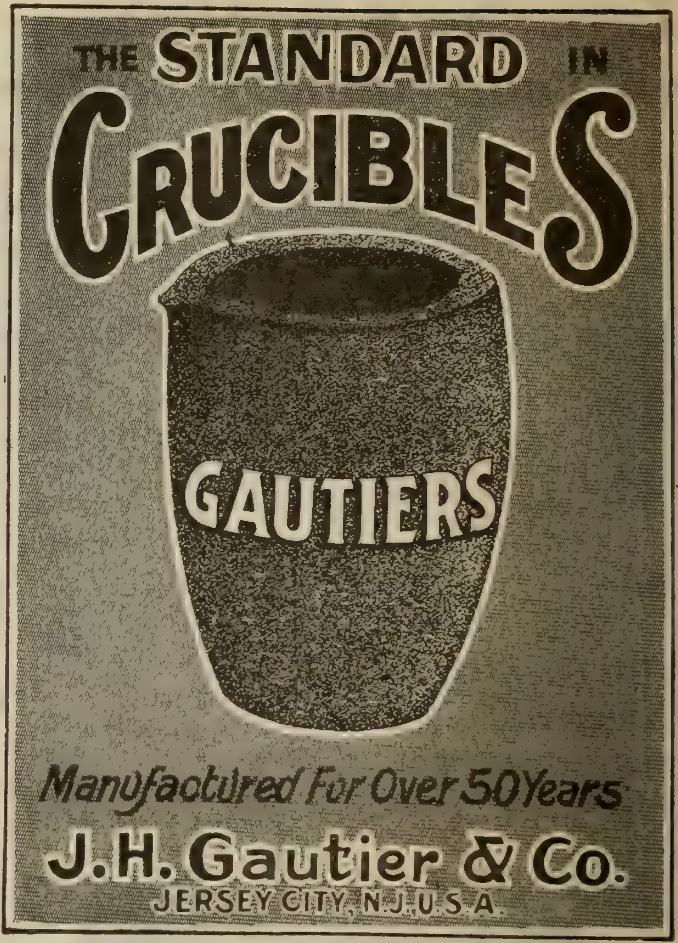
No complex parts to get out of order.

Bulletin 8608

Canadian Ingersoll-Rand Co., Limited

Sydney, N.S.
Sherbrooke, Que.
Montreal, Que.
Toronto, Ont.
Cobalt, Ont.

Timmins, Ont.
Winnipeg, Man.
Nelson, B.C.
Vancouver, B.C.
New York, N.Y.



THE STANDARD IN CRUCIBLES

GAUTIERS

Manufactured For Over 50 Years

J. H. Gautier & Co.
JERSEY CITY, N.J. U.S.A.

Look for the Buffalo on the Octagon cardboard spools.

Look for *Buffalo Brand* at the Milwaukee Exhibit

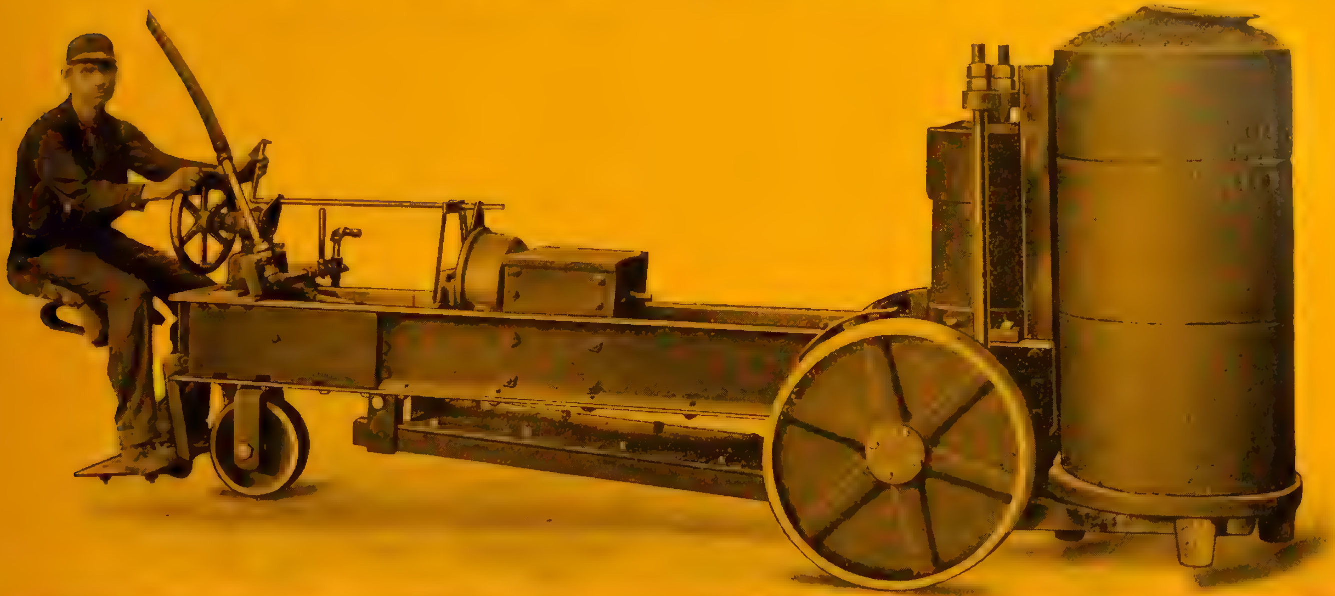
We'll be there, "right on the job"

Call and see us at Booth No. 28, and let's talk over your core-venting problem.

Remember the date, Oct. 7th-11th

United Compound Company
228 Elk St., - Buffalo, N.Y.

A New Charging Truck for Malleable Foundries



After complete and thorough tests of every kind—tests that would put an ordinary truck on the scrap heap—this new air-operated charging truck is now ready for the hardest service you can give it.

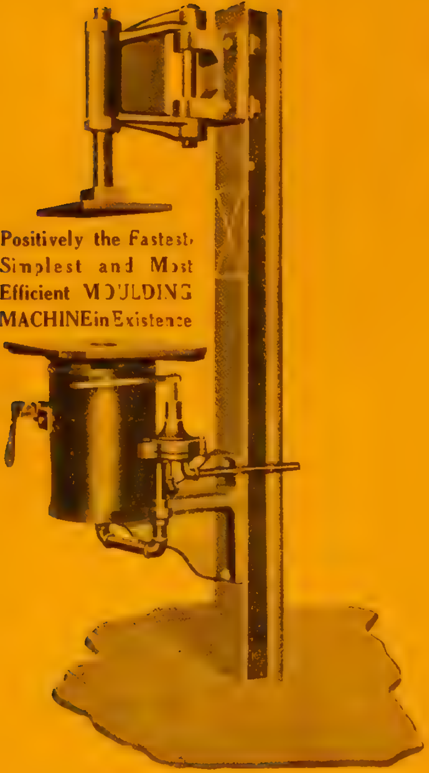
The main frame is made of two channel beams. The forged steel raising and lowering arms are equipped with removable cast steel tangs, easily replaceable when worn. The air cylinder for raising annealing pots is controlled by a valve near the operator's seat. A reversible air motor drives through a set of reduction gears and a standard auto truck differential to pinions engaging the internal gears on the under side of the wheel flanges. Steering is by means of a standard auto truck steering worm, arranged so that it can turn in its own length. Very low air consumption. Simple air mechanism. Sturdy construction. Easy steering. Economical operation. Minimum maintenance cost. Maximum service.

**See it at
Milwaukee
Oct. 7-11**

**Brown Specialty
Machinery Co.**
**2514 W. 48th Place
Chicago**

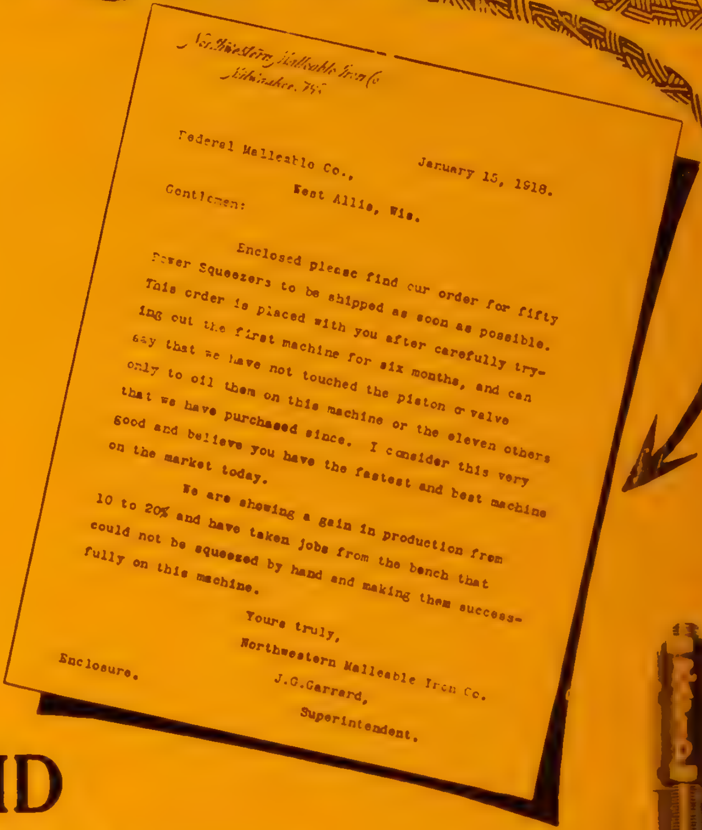
**Write
for Complete
Information**

BROWN



Positively the Fastest, Simplest and Most Efficient MOULDING MACHINE in Existence

"You have the fastest and best machine on the market to-day"



Northwestern Malleable Iron Co
Milwaukee, Wis.

Federal Malleable Co.,
West Allis, Wis.

January 15, 1918.

Gentlemen:

Enclosed please find our order for fifty Power Squeezers to be shipped as soon as possible. This order is placed with you after carefully trying out the first machine for six months, and can say that we have not touched the piston or valve only to oil them on this machine or the eleven others that we have purchased since. I consider this very good and believe you have the fastest and best machine on the market today.

We are showing a gain in production from 10 to 20% and have taken jobs from the bench that could not be squeezed by hand and making them successfully on this machine.

Yours truly,
Northwestern Malleable Iron Co.
J.G.Garrard,
Superintendent.

Enclosure.

RAPID
Moulding Machines

Needed in Canadian Foundries Now—

The unusual and unique construction of the **"Rapid" Molding Machine** places it in a class by itself, for **design,** for **construction** and for **results obtained** in Rapidity of Production.

The installation of the **"Rapid"** means an immediate increase in tonnage; an improvement in the quality of castings turned out. Can be operated by women as well as unskilled labor with unfailing results. Occupies a floor space five inches square. It will greatly simplify operations. It's the **fastest, simplest** and **most efficient** Molding Machine in world.

Send for full particulars.

THE ONLY MACHINE of its kind or Class in Existence

FEDERAL MALLEABLE CO.
WEST ALLIS, WISCONSIN

Canadian Agents:
STANDARD MACHINERY & SUPPLIES, LIMITED
MONTREAL

CANADIANS—Come to Milwaukee week of October 7th—see "Rapid" Molding Machine in operation by our Wisconsin agents, Foundrymen's Supply Company—Booth 264, Machinery Hall.

Sterling

ROLLED STEEL FLASKS—

Now extensively used in the world's greatest foundries.

The standard flask equipment in the leading High Schools, Colleges, and Trade Schools.

Sterling Flasks

Wheelbarrows, trucks, snapflasks, wedges, etc., will be on display at the Foundry and Machine Exhibition, Milwaukee, October 7th to 12th.

We welcome the Canadian foundrymen and hope many of you will inspect the Sterling line and visit our factory while in Milwaukee. We want to show you that we can most capably handle your orders.

Write now for complete information and send us your flask specifications.

Sterling Wheelbarrow Company, Milwaukee, Wis.

Warehouses: CHICAGO NEW YORK CLEVELAND DETROIT

FLINT SILICA

A washed, rewashed
Steam-dried, screened,
Manufactured product,
Segregated from St. Peters Rock

A "FIND" for any steel foundry. A necessity in electric steel practice.
Withstands the highest temperatures. Does not burn or flux.
Has remarkable free-venting properties.
Its uniform purity and freedom from natural bonding material make it a KNOWN QUANTITY in every sand-mix formula.
Uniform *roundness* of granules gives a clean "draw."
Flint Silica contains nothing to form gases in the mold.

Send for Envelope
Sample and Quotation

United States Silica Company

1939 People's Gas Building
Chicago

Meet Us At Milwaukee

Our Exhibit will be full of interest to every man concerned with sand blasting or steel molding.

FOR "FLINT SHOTTING" SHELLS AND MUNITIONS

FLINT SHOTTING is simply a long step forward in sand blasting. In short, it *is* sand blasting, with *Flint Shot*—a manufactured product—instead of sand blast sand.

And *Flint Shot* is pure flint silica, segregated from St. Peters rock, a remarkable geological formation found only in a limited area, near Ottawa, Illinois, U.S.A.—an area which we own.

To produce *Flint Shot,* we blast the rock; disintegrate the broken rock with water under high pressure; wet-screen the resulting sand water; agitate the screened sand and carry off its clay and magnesia impurities by flotation; steam dry the clean, round pearl-like particles; pass them through successive agitator screening; and deliver to our *"Flint Shotting"* patrons, car lots of *the most perfect sand blasting abrasive ever produced,* representing perhaps 10 per cent. of the total tonnage handled, the medium grade being sold as washed, dried, screened "Flint Silica" molding and core sand and the finer grade as glass sand.

LITTLE JOURNEYS OF THE FLINT SHOT MAN
SAND BLASTING IN ITS MANY PHASES AS DONE IN MANY SHOPS, WITH
FLINT SHOT
UNITED STATES SILICA CO.
SOLE MAKERS OF FLINT SHOT
CHICAGO

Flint Shot is an economical sand blasting abrasive, even at our price of $3.50 per ton, f.o.b. Ottawa, because one car of this abrasive will do as large a volume of work as several cars of natural sand, in less time, with less labor; air and overhead cost.

It is in widespread use in Canada, from Quebec to Medicine Hat, notwithstanding the cost of the long freight haul, and especially for shell and munition work, in which the cleanness of the surface treated is a prime consideration.

Envelope sample and quotation will be mailed immediately to enquirers as well as a list of Canadian users on request.

UNITED STATES SILICA COMPANY
1939 PEOPLES GAS BLDG. :-: CHICAGO, ILL.

An Invitation to

Canadian Foundrymen

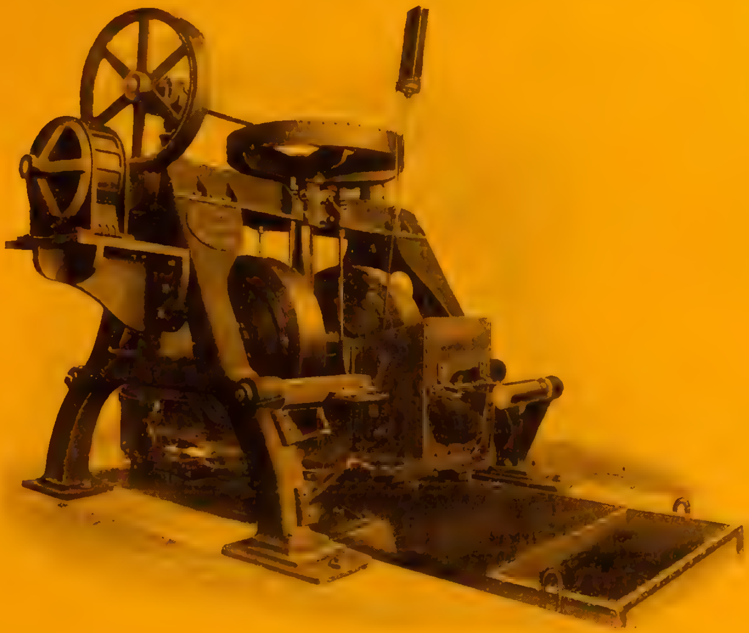
to visit the largest and most modern plant of its kind in the United States. You are all acquainted with P & H. Traveling Cranes, Single-Line Grab-Buckets, and Drilling and Boring Machines; come and see where and how they are made. We are justly proud of our plant and facilities and we should like to show you why we are. Put us down on your list of engagements; old friends as well as new.

PAWLING & HARNISCHFEGER CO.
38th & National Avenues
MILWAUKEE WISCONSIN

Manufacturers of
ELECTRIC TRAVELING CRANES
SINGLE-LINE GRAB-BUCKETS
DRILLING & BORING MACHINES
EXCAVATING & TAMPING MACHINES

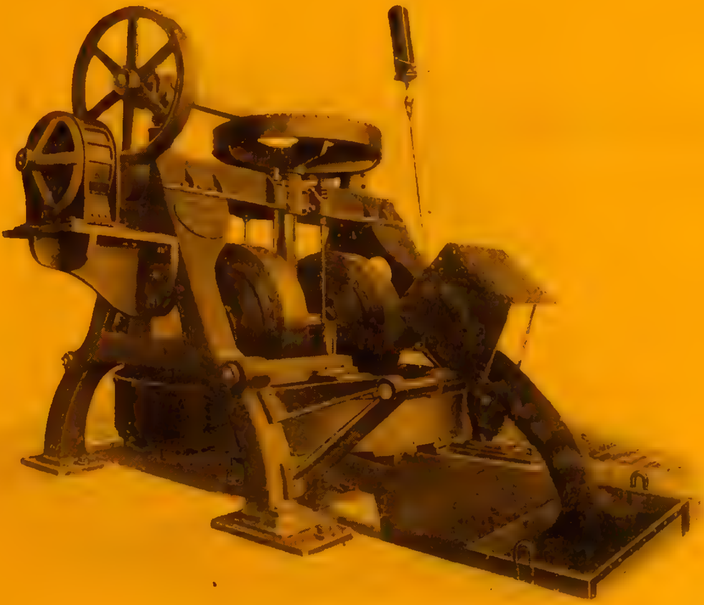
QUALITY
P&H
SERVICE

Frost Wet Pan Sand Mill For Steel Foundries



BUCKET FILLING

A batch mill having one air valve to control the entire operation of dipping the mixture from pan and dumping into the pit. Very heavy mullers. Revolving pan. Large capacity. Motor or belt driven. Mullers suspend on springs, allowing adjustment. Chilled removable muller rims, also chilled grinding plates. It is correctly designed.



BUCKET DUMPING

THE FROST MANUFACTURING COMPANY

Works: GALESBURG, ILL. **General Sales Offices:** 112 W. Adams Street, CHICAGO

Holland Core Oil Company
4600 W. Huron St
CHICAGO
ILLINOIS

HOLLAND PRODUCTS
GOOD PRODUCTS ONLY

HOLLAND PRODUCTS:

Core Oils
Linseed Oil
Match Oil

Hi-Binder
Dry Core
Compounds

Hi-Binder Core Flour

The Only Substitute for Flour

We shall be very happy to meet our old and new friends and all interested in Holland Products at our display, Space No. 37, at the coming convention in Milwaukee.

Holland Core Oil Co.

80 to 100% SCRAP

VS.

50 to 70% PIG IRON

Some foundrymen we know of formerly used 50 to 70% pig iron, but are now making good castings with LESS DEFECTIVES using from 80 to 100% SCRAP.

McLain's System Inc., March 20, 1917.
Milwaukee, Wis.
Attention Mr. David McLain

Gentlemen:—

Wish to say that our melting conditions are greatly improved since applying the principles set forth in your course on foundry and cupola practice. We are now melting up to cupola capacity PRODUCING BETTER CASTINGS than under the old system—effecting a *large saving* on Coke, firebrick and clay.

Coke costs us $16 per ton, and previous to enrolling with you we were melting at a ratio of 6 to 1 between charges, BUT NOW WE ARE MELTING at 12 to 1.

We are making Semi-Steel with very gratifying results—40% steel and 60% MIXED AGRICULTURAL AND HEAVY MACHINERY SCRAP.

Yesterday we made a variety of castings in the Semi-Steel heat consisting of medium and heavy sections such as gear wheels, and pulleys of heavy section, all of which run perfectly sound with a nice close grain and readily machined in sections not less than ¾" thick.

(Name on request)

YOU NEED McLAIN'S SYSTEM OF SCIENTIFIC MELTING AND MIXING OF IRON WITH STEEL SCRAP

CONTRARY TO GENERAL BELIEF, LESS COKE is required to melt McLAIN'S SEMI-STEEL than is used by the majority of foundrymen melting gray iron.

We extend a cordial invitation to visiting foundrymen convention week to make our office, opposite the Pfister Hotel, also our booth, 49 Convention Hall, their headquarters.

McLAIN'S SYSTEM, Inc.
700 Goldsmith Building MILWAUKEE, WIS.

McLAIN'S SYSTEM, INC.
700 Goldsmith Bldg., Milwaukee, Wis.
Send me semi-steel booklet FREE
Name ....
Firm ....
Address ....
Position 9 18

No. 512

Chrome Tan Leather Legging with extra heavy flare. Affords full leg and foot protection. Easily put on. No straps or buckles. Well made and long wearing.

LABOR IS SCARCE

Protect your men against accidents

You'll not only keep production and profit at its maximum but will create a spirit of good will among your employees by protecting them against the daily burns and accidents of foundry work.

WHEELER PROTECTIVE WEARING APPAREL

WHEELER PROTECTIVE WEARING APPAREL

provides the most complete protection possible and includes such articles as Asbestos and Fireproofed Duck and Leather Leggings, Spats, Aprons, Gloves, Mittens, Helmets, Coats, Pants, Hand Leathers, etc.

Write for complete catalog.

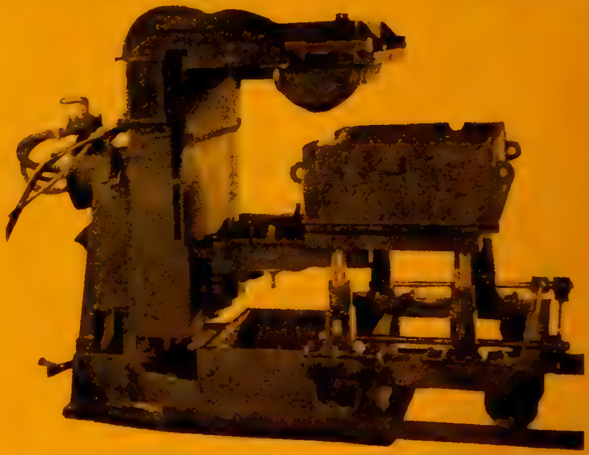
No. 515

A special Chrome Tan Leather Legging for molders and foundry workers wearing Congress Shoes. Gives absolute leg protection without interfering with free leg motion. Strong and durable.

F. H. WHEELER MFG. CO.

25 EAST JACKSON BLVD., CHICAGO

Foundry Equipment Bargains



Grimes Rock-Over Jar Moulding Machine

ELECTRIC CRANES

1 20-ton 4 motor 34′ span 500 V. D. C., P. & H.
1 15-ton 3 motor 220 volt D. C. 41′ span.
1 20-ton 3 motor, 3 phase, 60 cycle, 220 volt, 31′ span.
6 1½ Sprague Electric Cranes 22′ span with hoists 220 V.D.C.
1 10-ton, 40′ span, 220 V.D.C.
2 Whiting 1-ton Wall Travelling Cranes.

CUPOLAS

1 each, 36″, 41″, 84″ Whiting, 58″ Colliau.

LADLES

4 1-ton Ladles. 2 ½-ton Truck Ladles.

BLOWERS

1 No. 7 Roots Positive Pressure, 1 No. 5.
1 33′ Connersville.
1 No. 5 Roots with New York Safety Steam Engine.
1 No. 5 Wilbraham Green, 19 cu. ft. displacement.
1 No. 2 Garden City Positive Pressure.
1 No. ½ Roots.
1 45″ Exhauster.
All sizes Fan Blowers.

MOLDING MACHINES

12 Tabor Rock Overs.
1 Grimes Rock Over Jar Molding Machine (see cut).
2 Tabor Squeezers; will take 24 x 48 flask.
Osborne Jolting, 36″ x 60″ top.
4 Adams Portable Squeezers.

AIR RECEIVERS

1 40″ x 72″. 2 48″ x 84″. 1 42″ x 96″.

AIR COMPRESSORS

1 8 x 8 Advance with Receiver.
1 6 x 8 Double Cylinder Ingersoll Rand.
1 10 x 10 Ingersoll Rand.
1 6 x 6 Ingersoll Rand.

HOISTS

1 ½-ton Sprague Electric, 220 volt. D. C.
1 10-ton Geared Air Motor Hoist.
6 Curtis 14″ Cylinder, 6′ lift Air Hoists.

MISCELLANEOUS EQUIPMENT

1 No. 1 Standard Sand Mixer.
1 Centrifugal Mixer.
2 Heavy Grinders.
4 Medium Size Grinders.
1 Tilgman Sand Blast Machine.
10 Warehouse Trucks, platform 24″ x 48″.
1 60″ x 15′ 4-head Planer.
1 Type M1 Dings Magnetic Separator, felt driven.
1 Slys 32 x 32 Sand Blast Tumbling Mill.
1 Pangborn Sand Blast Machine.
1 Sly 32 x 42 Cinder Mill.
15 Pig Iron Trucks.
1 42″ Magnet.
1 Hydro Pneumatic Elevator.
6 Pig Iron Cars.
1 2-ton Elevator, belt driven.

SCULLY-JONES & CO.

Railway Exchange Building, Chicago, Ill.
Chicago Representative for Blystone Mixers
Booth 291 at the Convention

80 to 100% SCRAP

VS.

50 to 70% PIG IRON

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700 Goldsmith Building MILWAUKEE, WIS.

McLAIN'S SYSTEM, INC.
700 Goldsmith Bldg., Milwaukee, Wis.
Send me semi-steel booklet FREE
Name ....
Firm ....
Addr. ....
Position 9 18

No. 512

Chrome Tan Leather Legging with extra heavy flare. Affords full leg and foot protection. Easily put on. No straps or buckles. Well made and long wearing.

LABOR IS SCARCE

Protect your men against accidents

You'll not only keep production and profit at its maximum but will create a spirit of good will among your employees by protecting them against the daily burns and accidents of foundry work.

WHEELER PROTECTIVE WEARING APPAREL

WHEELER PROTECTIVE WEARING APPAREL

provides the most complete protection possible and includes such articles as Asbestos and Fireproofed Duck and Leather Leggings, Spats, Aprons, Gloves, Mittens, Helmets, Coats, Pants, Hand Leathers, etc.

Write for complete catalog.

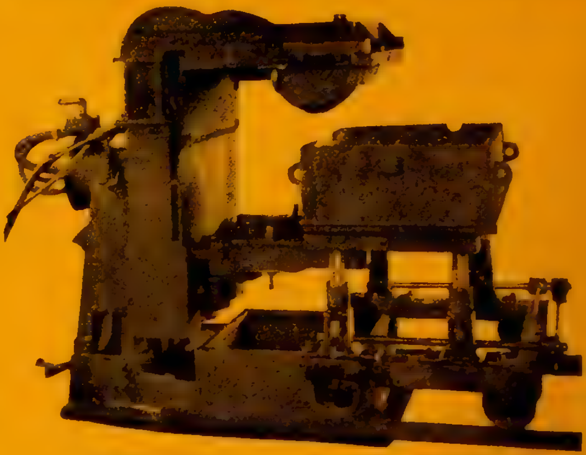
No. 515

A special Chrome Tan Leather Legging for molders and foundry workers wearing Congress Shoes. Gives absolute leg protection without interfering with free leg motion. Strong and durable.

F. H. WHEELER MFG. CO.

25 EAST JACKSON BLVD., CHICAGO

Foundry Equipment Bargains



Grimes Rock-Over Jar Moulding Machine

ELECTRIC CRANES

1 20-ton 4 motor 34′ span 500 V. D. C., P. & H.
1 15-ton 3 motor 220 volt D. C. 41′ span.
1 20-ton 3 motor, 3 phase, 60 cycle, 220 volt, 31′ span.
6 1½ Sprague Electric Cranes 22′ span with hoists 220 V.D.C.
1 10-ton, 40′ span, 220 V.D.C.
2 Whiting 1-ton Wall Travelling Cranes.

CUPOLAS

1 each, 36″, 41″, 84″ Whiting, 58″ Colliau.

LADLES

4 1-ton Ladles. 2 ½-ton Truck Ladles.

BLOWERS

1 No. 7 Roots Positive Pressure, 1 No. 5.
1 33′ Connersville.
1 No. 5 Roots with New York Safety Steam Engine.
1 No. 5 Wilbraham Green, 19 cu. ft. displacement.
1 No. 2 Garden City Positive Pressure.
1 No. ½ Roots.
1 45″ Exhauster.
All sizes Fan Blowers.

MOLDING MACHINES

12 Tabor Rock Overs.
1 Grimes Rock Over Jar Molding Machine (see cut).
2 Tabor Squeezers; will take 24 x 48 flask.
Osborne Jolting, 36″ x 60″ top.
4 Adams Portable Squeezers.

AIR RECEIVERS

1 40″ x 72″. 2 48″ x 84″. 1 42″ x 96″.

AIR COMPRESSORS

1 8 x 8 Advance with Receiver.
1 6 x 8 Double Cylinder Ingersoll Rand.
1 10 x 10 Ingersoll Rand.
1 6 x 6 Ingersoll Rand.

HOISTS

1 ½-ton Sprague Electric, 220 volt. D. C.
1 10-ton Geared Air Motor Hoist.
6 Curtis 14″ Cylinder, 6′ lift Air Hoists.

MISCELLANEOUS EQUIPMENT

1 No. 1 Standard Sand Mixer.
1 Centrifugal Mixer.
2 Heavy Grinders.
4 Medium Size Grinders.
1 Tilgman Sand Blast Machine.
10 Warehouse Trucks, platform 24″ x 48″.
1 60″ x 15′ 4-head Planer.
1 Type M1 Dings Magnetic Separator, felt driven.
1 Slys 32 x 32 Sand Blast Tumbling Mill.
1 Pangborn Sand Blast Machine.
1 Sly 32 x 42 Cinder Mill.
15 Pig Iron Trucks.
1 42″ Magnet.
1 Hydro Pneumatic Elevator.
6 Pig Iron Cars.
1 2-ton Elevator, belt driven.

SCULLY-JONES & CO.

Railway Exchange Building, Chicago, Ill.

Chicago Representative for Blystone Mixers

Booth 291 at the Convention

SIMPSON
INTENSIVE FOUNDRY MIXER

Economical and efficient for all kinds of Sand Mixtures

Note the
AUTOMATIC
DISCHARGE

It saves
LABOR
BINDER
and
COAL DUST

It improves the
quality of
the castings

Its work is
done thoroughly
not partially

Elasticity and
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sand are
enormously
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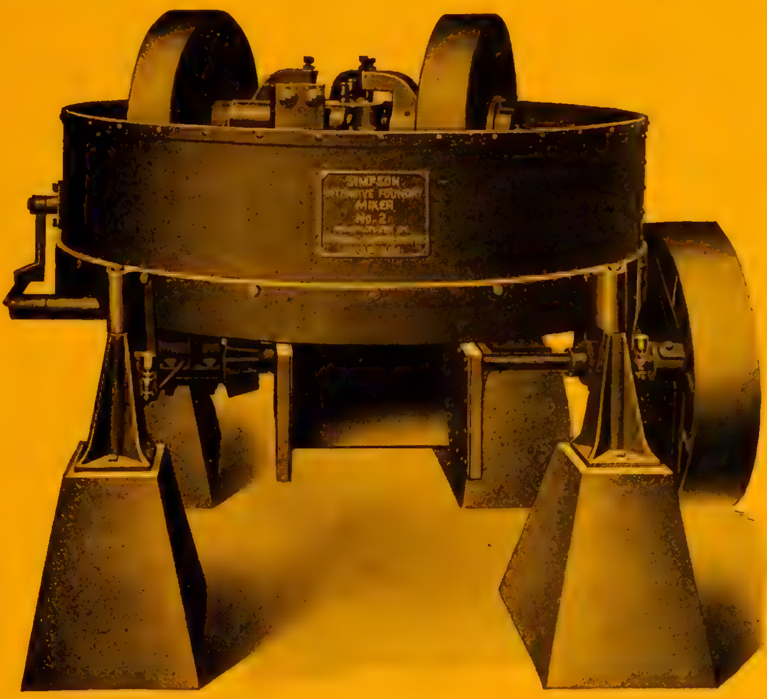

"The Product of a
Practical Foundryman"

It grinds
the mixtures
together

Small H. P.
required with a
minimum
of repairs

Pays for itself
in an
incredibly
short time

Original
porosity of sand
mixture
maintained

Large capacity
with a minimum
of labor

Will reclaim old
and worn out
sand for reuse

¶ The large number of Simpson Mixers in use in Canada and United States testifies to its efficiency. Send for our pamphlet No. 20 and list of users.

Simpson Mixer is made in two sizes

No. 1—4 ft. diameter—H. P. 3¾— 5 H. P. Motor
No. 2—6 ft. diameter—H. P. 7¾—10 H. P. Motor

NATIONAL ENGINEERING COMPANY

Tacoma Building, 5 N. La Salle St.
CHICAGO, ILL.

Compressed Air—for the Foundry Show—

October 7-12 will be supplied, as usual, by a

SULLIVAN ANGLE COMPOUND AIR COMPRESSOR

"WJ-3" Compressor, Air Inlet Side

Visitors to the Boston show last year were impressed with the silent smoothness with which this machine ran—with its compactness and simplicity.

We want you to *see* these advantages and *hear* the "WJ-3" run if you can!

Booths 397-8, N.E. corner of Machinery Hall. Canadian visitors are especially welcome.

Bulletin 75-CC

SULLIVAN MACHINERY COMPANY

122 So. Michigan Ave., CHICAGO, ILL. **37 Colborne St., TORONTO**

Labor Shortage

In your sand-riddling operations the labor shortage problem is solved by the use of—

Rodgers Electric Sand Riddle

The riddle is designed to **save labor,** and do work in the least time at the least cost.

It is strong and durable and will stand all the work that you care to put to it. The machine is easily moved around and it only requires a 1½ H.P. motor to drive it.

The Rodgers Electric Sand Sifter complete with motor and belt is $400 F.O.B. cars, shop, Muskegon. A deduction of $100 is made to purchasers wishing to furnish their own motor. Canadian buyers are required to pay duty but this is a trifling matter in consideration of the merits of the machine and its saving possibilities.

No Canadian foundryman can afford to be without our Sand Sifter in these days of labor shortage and climbing costs. Investigate!

Rodgers Boiler & Burner Co., Muskegon, Mich.

SIMPSON INTENSIVE FOUNDRY MIXER

Economical and efficient for all kinds of Sand Mixtures

Note the
AUTOMATIC
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It saves
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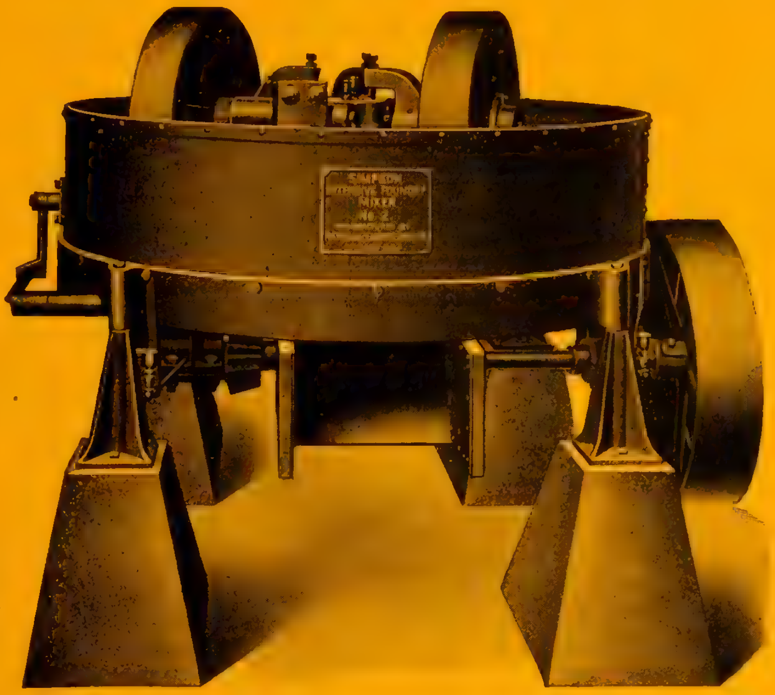
Elasticity and toughness of sand are enormously increased



"The Product of a Practical Foundryman"

It grinds the mixtures together

Small H. P. required with a minimum of repairs

Pays for itself in an incredibly short time

Original porosity of sand mixture maintained

Large capacity with a minimum of labor

Will reclaim old and worn out sand for reuse

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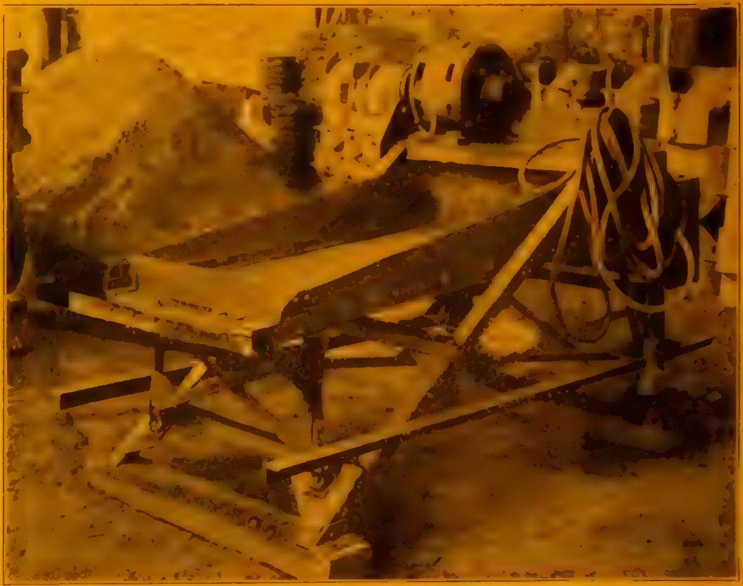

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Rodgers Boiler & Burner Co., Muskegon, Mich.

BRIQUET-INGOTS
(TRADE-MARK)

From Copper Shell Band Turnings

Our success in purifying and briquetting brass, and converting it into

BRIQUET-INGOTS
(Trade Mark)

has brought us repeated requests to develop our system to include copper shell-band turnings.

This we have now done, and our Chicago plant is ready to execute contracts for this conversion service, at 1½c per lb. in carlots.

These copper Briquet-Ingots assay 99.9% pure, and are therefore available for use in the place of virgin ingot copper, commanding a corresponding price.

Metal Block Corporation
208 LaSalle Street
Chicago

Shipments should be routed care of Chicago and Northwestern Railways, Cragin, Chicago

Canadian Foundries Should Protect their Men from the Danger of Accidents

The constant fear of getting burnt greatly hinders production and affects the morale of your employees.

Equip your help with

HOLCOMB SAFETY GARMENTS

The cost is not great but considerably smaller than that of one accident.

Let us figure with you on any of the following items:

ASBESTOS MITTENS, ASBESTOS SUITS, ASBESTOS GLOVES, ASBESTOS AND DUCK APRONS, ASBESTOS, LEATHER AND DUCK HIP LEGGINGS, SPRING KNEE LEGGINGS IN ASBESTOS, LEATHER AND DUCK.

HOLCOMB SAFETY GARMENT CO.
14 SOUTH JEFFERSON ST., CHICAGO, ILL.

This PECK Slip Jacket "B"

Is the Lightest Guaranteed Jacket Made

At the Milwaukee Convention find us at Booth No. 116, on the stage.

Steel; sides straight or taper; corners acetylene welded and therefore greater in strength than the original metal.

Ask for Foundry Equipment Catalog S.
It helps to make foundry work profitable.

PECK IRON AND STEEL WORKS
KALAMAZOO, MICH.

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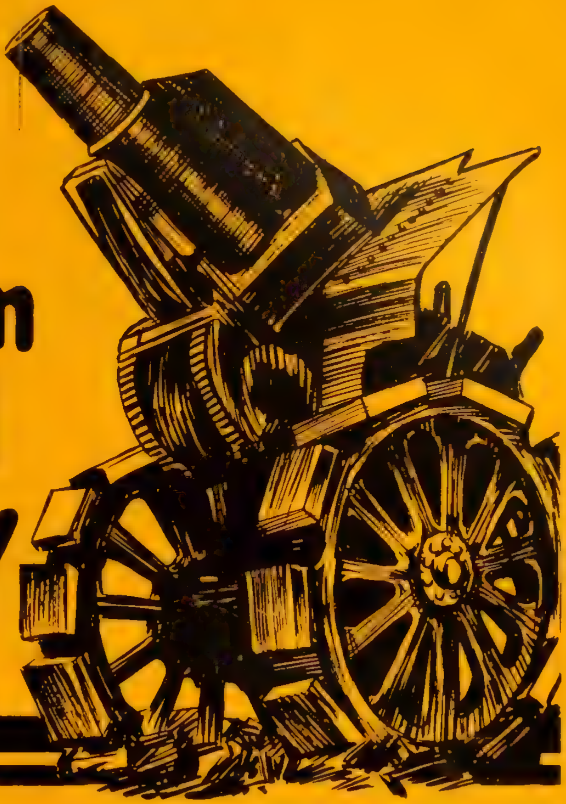
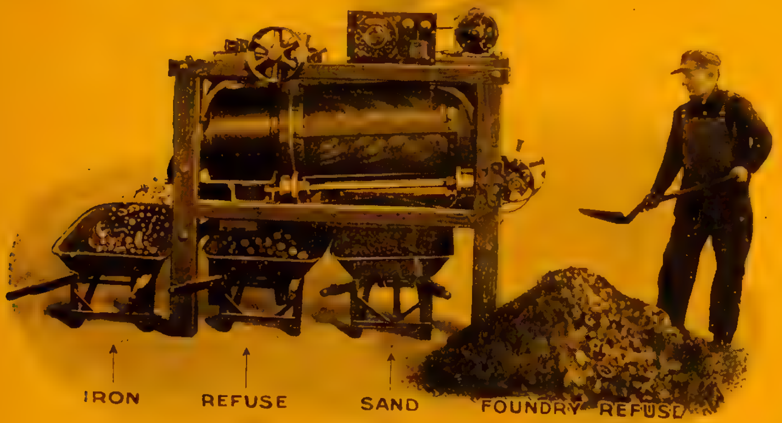
Don't waste it!



INSTALL A
DINGS
MAGNETIC
SEPARATOR

Foundrymen! When you attend the convention at Milwaukee, don't fail to pay special attention to DINGS MAGNETIC SEPARATOR.

You will quickly appreciate its merits. You will see how quickly and thoroughly it separates valuable metal from worthless material, how it takes care of anything that can be handled with a shovel—stray brick bats, gaggers and large pieces of material often found in foundry refuse.



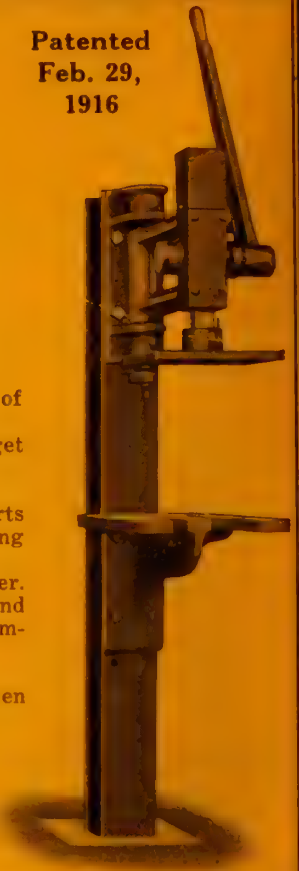
DINGS MAGNETIC SEPARATOR is found in the largest foundries of America and in many other kinds of industrial plants where metal is used. These plants recover thousands of dollars worth of metal that would otherwise be wasted. Help supply the demand for big guns in France—install a DINGS MAGNETIC SEPARATOR and save the waste. REMEMBER, see it at Milwaukee.

Dings Magnetic Separator Co.
MILWAUKEE 675 Smith Street WISCONSIN

Stop the High Cost of Molding *with* MOLINE SQUEEZERS

Just received repeat order for 12 machines from McKinnon Corp., St. Catharines, Ont., who were convinced of the merits of machine after trying sample a few weeks.

Patented Feb. 29, 1916



MOLINE SQUEEZERS eliminate high cost of compressed air.
All working parts above table. Sand cannot get into mechanism.
Require but 25 sq. in. floor space.
Approximately one-half number of working parts as compared with many other types of molding machines.
The swinging arm balanced on hardened steel center.
The parts are made of steel, malleable iron, and semi-steel castings, thus insuring long and economical service.
Can use flasks as large as 12″ x 24″.
As many as 285 molds (10″ x 16″ flasks) have been made in 7¾ hours.
Investigate the Moline. Write to-day.

H. W. Cooper Saddlery Hardware Mfg. Co.
MOLINE, ILLINOIS

SCHWARTZ DEOXIDIZED FERROUS METALS MELTING AND REFINING PROCESS, PATENTED 1917

DEOXIDIZED Refined Semi-Steel and Deoxidized Refined Semi-Malleable, melted in the cupola and refined in the Schwartz Stationary Reverberatory Melting and Refining Furnace, tensile strengths of these metals are 40,000 to 50,000 pounds per square inch, either metals are not annealed, Steel and Malleable Iron, also made by this Process and Refining Furnace, 5,000 degrees Fahrenheit obtained in the center of the combustion zone. Melting and refining in this furnace reduces sulphur contents.

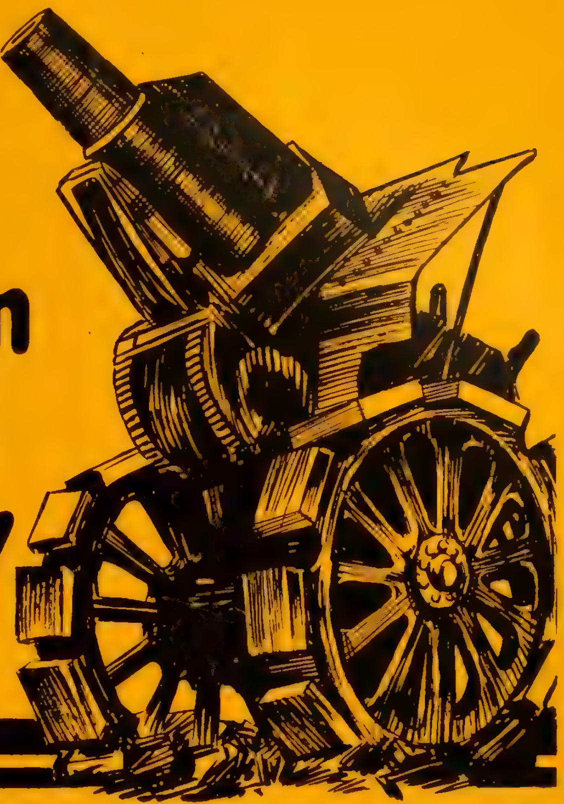
Edward H. Schwartz
Burner Combustion Systems, Oil, Gas, Pulverized Coal, Stationary and Tilting Reverberatory Melting and Refining Furnaces
436 Marquette Building, Chicago, Ill., U.S.A.

FOR CANADIAN FOUNDRIES

Hewlett-Demmler Core Machine

Manufactured by
Wm. Demmler & Bros.
Kewanee, Ill.

The Big Guns in France need a million tons of metal *Don't waste it!*



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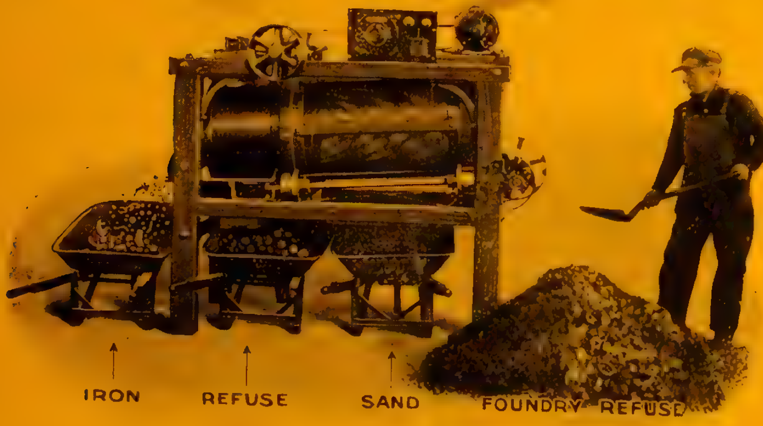

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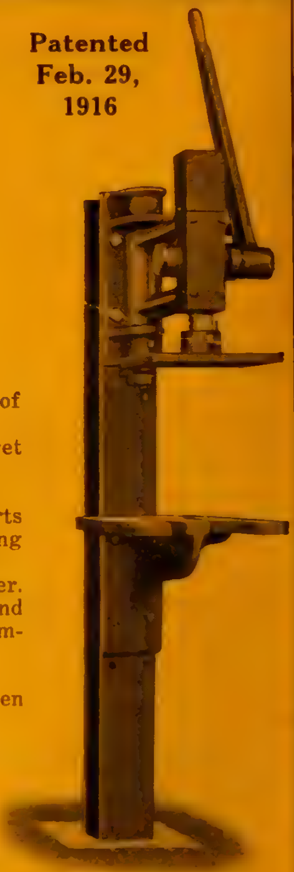

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436 Marquette Building, Chicago, Ill., U.S.A.

FOR CANADIAN FOUNDRIES

Hewlett-Demmler Core Machine

Manufactured by

Wm. Demmler & Bros.

Kewanee, Ill.

"702" Ceylon Plumbago

Rillton Ingot Mold Blacking

Peerless Perfect Parting Compound

ESSO

TRADE MARK REGISTERED

No. 702 Pure Ceylon Plumbago
Rillton Sea Coal Facing
"Kantbebeat" Core Compound
"Bull Dog" Core Wash
"Esso" Linseed Core Oil

"All These Brands stand for Efficiency and Reliability"

EVERYTHING YOU NEED IN YOUR FOUNDRY

The S. Obermayer Company

FACTORIES:
Chicago Cincinnati Rillton, Pa.

WAREHOUSES:
Pittsburgh St. Louis Denver Los Angeles

OFFICES:
Milwaukee Philadelphia Detroit

Canadian Representative: E. B. Fleury, 1609 Queen St. W., Toronto, Ont.

Rillton Brass Cleaner

Bull Dog Core Wash

Esso Cream Soapstone

Esso Plumbago Core Wash

Car Wheel Core Compound

No. 440 Mica Core Wash

XX Peerless Core Oil

Rillton Sea Coal Facing

Fairbanks Scales

for every Foundry Purpose

The World's Standard for over 90 Years.
Scales that made weighing accurate.
For every weighing requirement.

Made in Canada

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

Departments

Scale, Valve, Auto Accessory, Engine, Pump, Electrical Machinery, Transmission, Railway and Contractors, Machine Shop Supply, Marvel Mill, Pulp and Paper.

Sales Offices

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Foundrymen Will Gather in Milwaukee Oct. 7

Several Associations Are Holding Big Gathering, When Matters of Importance Will be Considered—Exhibition of All Sorts of Labor-saving Machinery For Metal Working Will be a Feature

AT Milwaukee, during the week of October 7, will be held the greatest gathering of metal manufacturers ever assembled in this or any other country. Simultaneous meetings will be held by the American Foundrymen's Association, Iron and Steel section of the American Institute of Mining Engineers, Institute of Metals division of the American Institute of Mining Engineers, and American Malleable Castings Association. Concurrent with these meetings will be conducted an exhibition of all kinds of labor saving metal working equipment. Every branch of the metal industries will be represented, including the gray iron, steel, malleable iron and brass foundry trade; iron and steel industry, from the mining of the ore to the production of pig iron, its conversion into steel and finally the rolled product and the brass and copper mill rolling industry.

The keynote of many of the addresses and papers that will be presented will be the acceleration of production for the prosecution and winning of the war. In fact, the purpose underlying the holding of this great meeting is to afford manufacturers of ordnance and other war equipment an opportunity for an interchange of ideas regarding methods of production and operation.

The great interest that is being manifested in this event is reflected by the large number of reservations for space in the Milwaukee Auditorium, where the exhibition will be held. Already 165 manufacturers have decided to make displays and only a comparatively small amount of space is still available. The indications are that this will be the largest show of its kind ever held in this country.

The manufacturers of Milwaukee already have organized committees on arrangements for the entertainment and reception of the visitors who will number from 3,500 to 4,000. The program, although not definitely outlined, will include a reception and dance at the Milwaukee Auditorium, theater party and boat ride. In addition the visiting ladies will be taken on an automobile sightseeing tour and will be tendered several luncheons. Plant visitation probably will be confined to Thursday and Friday and many notable works in the Milwaukee district will be open for inspection. On Thursday evening, Oct. 10, the banquet will be held and addresses will be delivered by speakers of international fame. The Milwaukee committees on ar-

THE AUDITORIUM AT MILWAUKEE WHERE THE CONVENTION OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION AND THE AMERICAN INSTITUTE OF METALS WILL BE HELD DURING THE WEEK OF OCT. 7, 1918.

rangements are constituted as follows:

General Committee

Theo. O. Vilter, chairman, president, Vilter Mfg. Co.; W. J. Fairbairn, secretary, Milwaukee Metal Trades and Founders' Association; A. Harrison, superintendent foundry and pattern shop, Allis-Chalmers Mfg. Co.; E. Bearman, Illinois Steel Co.; John D. Bird, general manager, Power & Mining Machinery Co., Cudahy, Wis.; James Marshall, general manager, Geo. H. Smith Steel Castings Co.; W. G. Bruce, secretary, Milwaukee Association of Commerce; Henry Weber, chairman, Milwaukee park board; Geo. Kuemmerlein, superintendent of transportation, Milwaukee Electric Railway & Light Co.; A. E. Copeland, manager, Hotel Wisconsin; W. P. O'Connor, general agent, Goodrich Transportation Co.; F. C. Reynolds, general agent, Pere Marquette railroad, and Jos. C. Grieb, manager, Milwaukee auditorium.

CITY HALL, MILWAUKEE.

GRAND AVE., LOOKING EAST

Finance Committee

Theo. O. Vilter, chairman, Vilter Mfg. Co.; W. G. Bruce, Milwaukee Association of Commerce; C. R. Messinger, Chain Belt Co.; J. D. Bird, Power & Mining Machinery Co., Cudahy, Wis.; T. A. Glasscott, Pickands, Brown & Co.; John Thomas, Thomas Furnace Co.; A. J. Lindeman, Lindeman & Hoverson Co.; Otto H. Falk, Allis-Chalmers Mfg. Co., and Walter Kasten, treasurer, finance committee, Wisconsin National Bank.

Entertainment Committee

Geo. Kuemmerlein, chairman, Milwaukee Electric Railway & Light Co.; Henry Weber, Milwaukee park board; J. J. McDevitt, S. Obermayer Co.; John Mertes, Federal Foundry Supply Co.; C. E. Lemmon, chemist; T. A. Glasscott, Pickands, Brown & Co.; James Marshall, Geo. H. Smith Steel Castings Co.; F. C. Reynolds, Pere Marquette railroad, and J. S. Pinson, Avery Co.

Golf Committee

J. D. Bird, chairman, Power & Mining Machinery Co., Cudahy, Wis.; C. R. Messinger, Chain Belt Co.; David McLain, McLain's System; F. E. Layman, chemist, and C. G. Ocock, Avery Co.

Reception Committee

E. Bearman, chairman, Illinois Steel Co.; Frank Cleveland, Milwaukee Association of Commerce; David McLain, McLain's System; J. D. Shaw, Shaw Foundry Co.; E. A. Wurcester, Falk Co.; J. A. McDevitt, S. Obermayer Co.; Henry R. Donald, Essley Machinery Co.; T. A. Glasscot, Pickands, Brown & Co.; O. B. Pupikofer, American Gum Products Co.; W. J. Fairbairn, Milwaukee Metal Trades & Founders' association; Roy Smith, Hotel Pfister; A. E. Copeland, Hotel Wisconsin; Henry Wehr, Wehr Steel Castings Co.; Herman Kletzsch, Republican House; W. W. Sommers, Hotel Carlton; W. M. Nefzger, Hotel Schiltz; S. Duffy, Hotel Plankinton, and F. B. Sweeney, Hotel Maryland.

Plant Visitation Committee

A. Harrison, chairman, Allis-Chalmers Mfg. Co.; James Marshall, Geo. H. Smith Steel Casting Co.; H. R. Donald, Essley Machinery Co; Wells K. Greg and H. G. Siefert.

Banquet Committee

W. P. O'Connor, chairman, Goodrich Transportation Co.; A. E. Copeland, Hotel Wisconsin, and H. Weber, Wilwaukee Park Board.

Theatre, Automobile and Boat Excursion Committee

James Marshall, chairman, Geo. H. Smith Steel Casting Co., and J. C. McDevitt, S. Obermayer Co.

Ladies' Committee

E. E. Copeland, chairman, Hotel Wisconsin; F. C. Reynolds, Pere Marquette railroad; Henry Weber, Milwaukee park board and O. B. Pupikofer, American Gum Products Co.

The meetings of the Allied Metal Trades Association will be opened on Tuesday morning, Oct. 8, with a joint session at which the address of welcome will be delivered by Emanuel L. Phillip, governor of Wisconsin. This will be followed by addresses relating to the importance of the metal working industry in the prosecution of the war by speakers of note who are familiar with the activities at Washington. Upon adjournment, the opening session of the American Foundrymen's Association, Iron and Steel section, and the Institute of Metals division of the American Institute of Mining Engineers will be called to order in separate halls in the Milwaukee Auditorium where the activities of the week will be centered.

Will Use Moving Pictures

The exhibition will be opened formally on Monday afternoon, Oct. 7. Beginning Tuesday, Oct. 8, the American Foundrymen's Association will hold daily meetings in the morning only, and on several days simultaneous sessions will be necessary to dispose of the lengthy program in time for adjournment Friday noon, Oct. 11. The Institute of Metals division of the American Institute of Mining Engineers will have one meeting on Tuesday, two on Wednesday, and one on Thursday. The Iron and Steel section of the American Institute of Mining Engineers will hold three meetings and will adjourn Wednesday afternoon. Only one meeting is scheduled by the American Malleable Castings Association.

One of the notable features of these meetings will be the large number of interesting moving pictures that will be shown. These will include the use and manufacture of hand grenades; the civil re-establishment of wounded and crippled Canadian soldiers; the manufacture and launching of ships at the Hog Island yard, Philadelphia; the building of concrete ships; the manufacture of steel by the triplex process, and the cause and prevention of industrial accidents.

The program of the American Foundrymen's Association includes a large number of papers of interest to manufacturers of gray iron, steel and malleable castings. To dispose of the program in the time alloted, separate sessions will be held for the consideration of papers relating to gray iron, steel and malleable iron foundry practice. An accident prevention conference also is scheduled at which a large number of papers will be presented and addresses delivered on the conservation of life and limb in industrial plants.

The Program of Events

A tentative program of the topics that will be discussed follows:

"Sand-Blasting Equipment," by C. T. Bird, Pangborn Corp., Hagerstown, Md.

"Engineers—Their Relation to the Foundry in the Saving of Labor," by E. S. Carman, Cleveland Osborn Mfg. Co., Cleveland.

"Pouring Devices," by Mark P. Ohlsen, Brillion Iron Works, Brillion, Wis.

"Effective Means of Improving the Quality of Sand Mixtures," by H. B. Hanley, New London Ship & Engine Co., Groton, Conn.

"Common Troubles in Cupola Practice Which Tend to Cut Down Production," by G. S. Fisher, Whiting Foundry Equipment Co., Harvey, Ill.

"Women in Foundries," by C. E. Knoeppel, C. E. Knoeppel & Co., New York.

"Organizing a Foundry for Tractor Production," by Paul M. Ramp, Moline, Ill.

"Coke Problems of the Foundryman," by J. A. Galligan, Pickands, Brown & Co., Chicago.

"Recent Developments in Burning Oil in Cupolas," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.

"Continuous Operation of a Two-Storey Foundry," by J. F. Ervin, Michigan Motor Castings Co., Flint, Mich.

"Sale and Distribution of Foundry Pig Iron in War Times," by C. J. Stark, editor the "Iron Trade Review," Cleveland.

"Concrete Foundry Floors," by George Moyer, Textile Machine Works, Reading, Pa.

"Training Your Own Help Instead of Competing With Other Manufacturers," by Ernest Van Billiard and T. Hough, Jr., General Railway Signal Co., Rochester, N.Y.

"Blowers," by J. Trinks, Pittsburgh.

"Precipitation of Dust in Foundries," by H. D. Egbut, Research Corp., New York.

"Pyrometers and Their Application to Core Ovens," by J. P. Goheen, Brown Instrument Co., Philadelphia.

"Cast Iron in Service Projectiles and Trench Warfare," by Major Edgar Allen Custer, Pittsburgh district ordnance department, Pittsburgh.

Moving picture film on the "Manufacture and Use of Hand Grenades," by Major Frank B. Gilbreth, Providence, R.I.

"A Rapid Method for the Determination of Graphitic Carbon," by Frank H. Kingdom, Metallurgist, Sullivan Machinery Co., Claremont, N.J.

"Cores in the Foundry," by Walter F. Prince, Elizabeth, N.J.

Malleable Iron Foundry Practice

"Some Features of Malleable Iron Practice," by J. G. Garrard, Northwestern Malleable Iron Co., Milwaukee.

"Soundness," by Enrique Touceda, Albany, N.Y.

"Annealing Malleable Iron," by H. E. Diller, General Electric Co., Erie, Pa.

"Use of Malleable Castings," by H. A. Schwartz, National Malleable Castings Co., Indianapolis.

"White Rim or Picture Frame Fractures," by J. B. Deisher, T. H. Symington Co., Rochester, N.Y

"Advantages of Malleable Iron versus Steel for Agricultural Castings," by W. A. Forbes, Rockford Malleable Iron Co., Rockford, Ill.

"The Symington Core Department," by Donald S. Barrows, T. H. Symmington Co., Rochester, N.Y.

Accident Prevention Conference

"The Cause and Prevention of Industrial Accidents," to be shown by moving pictures and illustrating accidents as reported to the Industrial commission of Ohio.

"Accident Prevention is Good Business," by Hon. Fred M. Wilcox, vice-president Wisconsin industrial commission.

"What the State Can Do to Prevent Accidents," by Hon. Thomas J. Duffy, chairman, Industrial commission of Ohio.

"What the Buckeye Steel Castings Co. Has Accomplished in Accident Prevention," by Fred G. Bennett, safety director, Buckeye Steel Castings Co., Columbus, O.

"The Importance of Organization in Accident Prevention," by C. W. Price, field secretary, National safety council, Chicago.

"The Vital Necessity of Conserving Man Power During the War," by Victor T. Noonan, safety director, Industrial commission of Ohio, Columbus, O.

"What Shall be Done with the Crippled Soldier," by W. A. Janssen, vice-president, Canadian Steel Foundries, Montreal, Canada.

Steel Foundry Practice

"Ordnance Steel for the Army and Navy," by John Howe Hall, Taylor Wharton Iron & Steel Co., High Bridge, N.J.

"Operating an Electric Furnace for the Production of Ordnance Castings," by W. E. Moore, Union Bank building, Pittsburgh.

"Steel Foundry Practice in the Far West," by J. D. Fenstermacher, Columbia Steel Co., San Francisco.

"Acid versus Basic Lining for Electric Furnaces," by F. J. Ryan, Electric Furnace Construction Co., Philadelphia.

An interesting report on the heat treatment of steels Nos. 2 and 3, specified by the ordnance department also will be submitted. This will be followed by a topical discussion of the manufacture of steel for ordnance purposes by foundrymen who have had a wide experience in this work.

The program of the Institute of Metals division of the American Institute of Mining Engineers is replete with practical topics of interest to the brass foundryman. One feature of this gathering will be the discussion of the conservation of tin and representatives of various industries using tin in manufacture will contribute to this symposium.

Tuesday Morning, Oct. 8

"The Metallography of Tungsten," by Zay Jeffries.

"The Constitution of the Tin Bronzes," by S. L. Hoyt.

"Notes on Babbitt and Babbitted Bearings," by Jesse L. Jones.

"Oxygen and Sulphur in the Melting of Copper Cathodes," by S. Skowrouski.

"The Relation of Sulphur to the Overpoling of Copper," by S. Skowrouski, with discussion by Philip L. Gill.

Wednesday Morning, Oct. 9

Symposium on "The Conservation of Tin." This topic will be discussed by the following:

G. W. Thompson, National Lead Co.

G. H. Clamer, Ajax Metal Co., Philadelphia.

C. M. Waring, Pennsylvania Railroad Co.

M. L. Lissberger, Mark Lissberger & Son, Inc., Long Island City, N.Y.

D. M. Buck, American Sheet & Tin Plate Co., Pittsburgh.

W. M. Corse, Buffalo.

G. K. Burgess and Mr. Woodward, United States bureau of standards, Washington, D.C.

M. L. Dizer, war industries board, Washington, D.C.

A representative of the Niles, Bement, Pond Co., New York.

A representative of the bureau of steam engineering, United States navy department, Washington, D.C.

Wednesday Afternoon, Oct. 9

"The Volatility of the Constituents of Brass," by John Johnston.

"Notes on the Metallography of Aluminum," by P. D. Merica and J. R. Freeman, Jr.

"The Effect of Impurities on the Hardness of Cast Zinc or Spelter," by G. C. Stone.

"Dental Alloys," by Dr. Arthur W. Gray.

"Electrolytic Zinc," by C. A. Hansen.

"The Condensation of Zinc From Its Vapor," by C. H. Fulton.

Thursday Morning, Oct. 10.

"Notes on Non-Metallic Inclusions in Bronzes and Brasses," by G. F. Comstock.

"Nichrome Castings," by Arlington Bengal.

"Fusible Plug Manufacture," by G. K. Burgess and L. J. Gurevich.

"Application of the Spectroscope to the Chemical Determination of Lead in Copper," by Messrs. Hill and Lucke.

The first session of the iron and steel section of the American Institute of Mining Engineers will be devoted to the consideration of papers on iron and steel topics. This will include the consideration of iron ores, ferro alloys, silica brick and the manufacture of steel. Another meeting will consider coal and coke. The program tentatively outlined follows:

SESSION ON IRON AND STEEL

Tuesday Morning, Oct. 8

"The Limonite Deposits of Mayaguez Mesa, Porto Rico," by C. R. Fettke and Bela Hubbard.

"The Manufacture of Ferro-Alloys in the Electric Furnace," by R. M. Keeney.

"The Manufacture of Silica Brick," by H. Le Chatelier and B. Bogitch.

"Notes on Some Iron Ore Resources of the World."

"Recent Geologic Developments on the Mesabi Iron Range," discussion by Anson A. Betts and J. F. Wolff.

"A Volute Ageing Break," by Henry M. Howe.

Moving Pictures of the Triplex Steel Process.

SESSION ON COAL AND COKE

Wednesday Morning, Oct. 9

"The By-product Coke Oven and Its Products," by W. H. Blauvelt.

"The Use of Coal in Pulverized Form," by H. R. Collins.

LEIF ERICSON MONUMENT IN JUNEAU PARK, MILWAUKEE. IT IS CLAIMED FOR ERICSON THAT HE DISCOVERED AMERICA 1,000 YEARS AGO.

"Carbocoal," by C. T. Malcolmson.

"Low-tempered Distillation of Illinois and Indiana Coals," by G. W. Traer.

"Price Fixing of Bituminous Coal by the United States Fuel Administration," by R. V. Norris and others.

MISCELLANEOUS SUBJECTS

Wednesday Afternoon, Oct. 9

Moving pictures showing the construction of concrete ships.

Moving pictures showing the civil re-establishment of crippled soldiers in Canada.

LAKE PARK.—MILWAUKEE IS FAMOUS FOR ITS WONDERFUL PARK SYSTEM—NO PART OF THE CITY IS MORE THAN WALKING DISTANCE FROM SOME PARK.

The exhibition of all kinds of labor saving equipment to be held in the Milwaukee Auditorium, both in size and number of individual exhibits, probably eclipses anything of its kind ever held. Machinery hall will be converted into a foundry and machine shop since practically all of the equipment to be displayed in this section of the auditorium will be operated. Many new devices will be shown which have been designed and built to facilitate the production of materials for the winning of the war. Exhibits will be made by the following manufacturers:

Abell-Howe Co., Chicago.
Abrasive Co., Philadelphia.
Allis-Chalmers Mfg. Co., Milwaukee.
American Gum Products Co., New York.
American Foundry Equipment Co., Cleveland.
American Kron Scale Co., New York.
E. C. Atkins & Co., Indianapolis.
Arcade Mfg. Co., Freeport, Ill.
Asbury Graphite Mills, Asbury, N.J.
Austin Co., Cleveland.
Ayer Lord & Tie Co., Chicago.
Badger-Packard Machinery Co., Milwaukee.
Barrett Co., Chicago.
Beaudry & Co., Boston.
Berkshire Mfg. Co., Cleveland.
S. Birkenstein & Sons, Chicago.
G. S. Blodgett Co., Burlington, Vt.
Blystone Mfg. Co., Cambridge Springs, Pa.
Brass World Publishing Co., New York.
Bristol Machine Tool Co., Bristol, Conn.
Brown Specialty Machinery Co., Chicago.
Buckeye Products Co., Cincinnati.
Bullard Machine Tool Co., Bridgeport, Conn.
Carborundum Co., Niagara Falls, N.Y.
Central Electric Co., Chicago.
Champion Foundry & Machine Co., Chicago.
Frank D. Chase, Chicago.
Chard Lathe Co., New Castle, Ind.
Charles J. Clark, Chicago.
Cincinnati Pulley Machinery Co., Cincinnati.
Cleveland Osborn Mfg. Co., Cleveland.
Cleveland Pneumatic Tool Co., Cleveland.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Thomas E. Coale Lumber Co., Philadelphia.
Combined Supply & Equipment Co., Buffalo.
Corn Products Refining Co., Chicago.
"Daily Iron Trade and Metal Market Report," Cleveland.
Dale-Brewster Machinery Co., Chicago.
Davenport Machine & Foundry Co., Davenport, Iowa.
Davis-Bournonville Co., Chicago.
Dayton Molding Machine Co., Dayton, O.
Deister Concentrator Co., Ft. Wayne, Ind.
Detroit Drill Co., Detroit.
Detroit Steel Products Co., Detroit, Mich.
Dings Magnetic Separator Co., Milwaukee.
Joseph Dixon Crucible Co., Chicago.
R. E. Ellis Engineering Co., Chicago.
Erwin Mfg. Co., Milwaukee.
Federal Foundry Supply Co., Cleveland.
Federal Machinery Sales Co., Chicago.
Foreign Crucibles Co., New York.
"The Foundry," Cleveland.
Foundry Appliance Co., Newark, N.J.
Foundry Equipment Co., Cleveland.
Foundrymen's Supply Co., Milwaukee.
Warren F. Fraser Co., Westboro, Mass.
Garden City Sand Co., Chicago.
General Electric Co., Schenectady, N.Y.
General Steel Co., Milwaukee.
Gooley & Edlund, Cortland, N.Y.
Gordon Sand Co., Conneaut, O.
Great Western Mfg. Co., Leavenworth, Kansas.
Greaves-Klusman Tool Co., Cincinnati.
Grimes Molding Machine Co., Detroit.
Hauck Mfg. Co., Brooklyn, N.Y.
Hausfield Co., Harrison, O.
Hayward Co., New York.
Henry & Wright Mfg. Co., Hartford, Conn.
Herman Pneumatic Machine Co., Pittsburgh.
Hoevel Mfg. Corp., New York.
Holcomb Safety Garment Co., Chicago.
Holland Core Oil Co., Chicago.
Hyatt Roller Bearing Co., New York.
Imperial Brass Mfg. Co., Chicago.
Industrial Electric Furnace Co., Chicago.
International Molding Machine Co., Chicago.
"The Iron Age," New York.
"The Iron Trade Review," Cleveland.
Jennison-Wright Co., Toledo, O.
Chas. Jurack Pattern Works, Milwaukee.
C. C. Kawin Co., Chicago.
Kearney & Trecker Co., Milwaukee.
Spencer, Kellogg & Sons, Buffalo.
Kempsmith Mfg. Co., Milwaukee.
Julius King Optical Co., Chicago.
Laclede-Christy Clay Products Co., St. Louis.
H. M. Lane Co., Detroit.
Loewenthal Co., Chicago.
Lees Bradner Co., Cleveland.
David Lupton's Sons Co., Philadelphia.
Marshall & Huschart Machinery Co., Chicago.
McCrosky Reamer Co., Meadville, Pa.
McLain's System, Milwaukee.
McLain Carter Furnace Co., Wilwaukee.
Mueller Machine Tool Co., Cincinnati.
MacLean Publishing Co., Toronto, Ont.
Macleod Co., Cincinnati.
Magnetic Mfg. Co., Milwaukee.
Mahr Mfg. Co., Minneapolis.
Marden, Orth & Hastings Corp., New York.
"Metal Industry," New York.
Metal & Thermit Corp., New York.
Modern Tool Co., Erie, Pa.
Monarch Engineering & Mfg. Co., Baltimore.
Mumford Molding Machine Co., Chicago.
Munroe Calculating Machine Co., New York.
Napier Saw Works, Springfield, Mass.
National Engineering Co., Chicago.
New Chicago Crucible Co., Chicago.
Wm. H. Nicholls Co., Brooklyn, N.Y.
Norma Co. of America, New York.
Norton Co., Worcester, Mass.
Oakley Machine Tool Co., Cincinnati.
S. Obermayer Co., Chicago.
Oesterlein Machine Co., Cincinnati.
Ohio Machine Tool Co., Kenton, O.
Oliver Machinery Co., Grand Rapids, Mich.
Oxyweld Acetylene Co., Chicago.
Pangborn Corp., Hagerstown, Md.
Pawling & Harnischfeger Co., Milwaukee.
Peerless Machine Co., Racine, Wis.
Peck Iron & Steel Works, Kalamazoo, Mich.
Penton Publishing Co., Cleveland.
George F. Pettinos, Philadelphia.
Phoenix Mfg. Co., Eau Claire, Wis.
Pickands, Brown & Co., Chicago.
Pittsburgh Furnace Co., Milwaukee.
Portage Silica Co., Youngstown, O.

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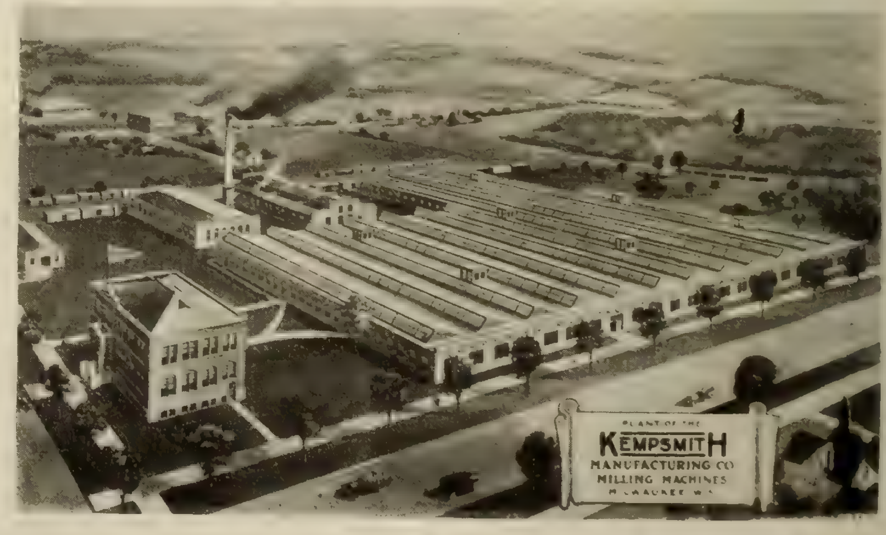


PLANT OF THE KEMPSMITH MANUFACTURING CO., MILWAUKEE

YOUR "UNCLE SAM" IS NOT A BLUFFER

Written by George A. Simpson, Sales Manager, The Steel Company of Canada, Limited, Hamilton, Canada, who wrote "Hundred Point Men," "Salesmanship From a New View Point," etc.

NOTWITHSTANDING the following, which I clipped from a Canadian paper, your "Uncle Sam" is not a bluffer, and this the Hun will find out to his sorrow:

> Washington, July 9.—Publication in Swiss papers of the text of Secretary of War Baker's letter to President Wilson, giving the American troops' movement to Europe by months, caused German authorities to permit its publication in Germany, according to a despatch received from Berne.
>
> The *Koelnische Zeitung* published the latter under the heading "American Bluff," the despatch says, and commented as follows:
>
> "Mr. Baker thinks he will be able to dissipate all doubts about exactitude of his figures with his recitations. It is, however, only the usual American bluff. We know from reliable sources that the figures in question are inordinately exaggerated and in no way correspond to the truth."

And furthermore, he will understand—if he does not already know—that the figures furnished by Secretary of War Baker are not "inordinately exaggerated," but they do correspond to the truth inasmuch as they only represent a small fraction of the force that will be exerted by Uncle Sam for the cause of humanity before the allied armies reach Berlin.

A Nation of Enthusiasts

The American is an enthusiast, fostering an ambition unbridled by traditionary restraint, for in him commingles the souls of the sturdy Pilgrim Fathers, beset with the cares of existence, conquering nature, felling trees, navigating rivers and fertilizing valleys, and the souls of the Colonists fighting for liberty and independence. He is the child of a country as boundless as the ocean, whose rivers are like rolling lakes, and the lakes like inland seas, the forests, the mountains, the plains, Niagara itself with its world of waters—all owe their magnificance to their immensity; and by transference, not unnatural although fallacious, the Sons of Uncle Sam have modelled their ideas and expressions on the huge scale of their magnificent country, and history proves that anything they have seriously set themselves to do. they have successfully accomplished. But this is to their credit, as nothing great has ever been accomplished without enthusiasm, but they are not bluffers.

It is true, and I must admit that the words "bluff" and "bluffer" are often applied to American statements and to those who make them. As to why they should be applied to the extent they are, I am at a loss to understand, unless it is through the application of a mental attitude that parallels, in a sense, that of the German toward the English. During the course of the war, I have been asked a number of times by residents of the United States what has England done to incur the hatred of Germany—as no one seems to question that a deep-seated hatred does exist—and to those who first propounded the question, I was at a loss to make an answer. Therefore, I undertook to analyze the subject and I asked myself the question, "What has England done to Germany?" and for the life of me I could not reach any logical conclusion, other than the one I will later outline which justifies in the German mind the Song of Hate, or the toast of "Der Tag" which, in English, is "The Day," meaning the day on which they could pick a fight and thereby show their brutal superiority over a race that they recognized, but would not admit, were their superiors in every commendable particular. I have therefore concluded that their hatred is caused by a mental attitude, born of the fact that the Englishman is a gentleman and as such is recognized by every nation with whom he comes in contact.

Mighty Handy With a Knife

I have before me a mental picture—not altogether imaginary, as I have attended gatherings where different nationalities have sat at the same table—and I can see the German, fat and coarse, with his napkin tucked inside his collar, disposing of his soup with musical accompaniment, using his knife and fork with the same elegance that a plumber would use his tools; in fact, the knife is more to his liking than the fork. I have watched him through the meal, ill at ease, feeling that he was not in harmony with the thought and environment of representative men. I have seen him called on to make a speech, or responding to a toast, rising awkwardly and even where he could speak good English, it sounded to me like someone gargling their throat. In other words, the German is coarse; he is the offspring of a race of butchers, soap-boilers and brewers, and he knows it and shows it. On the other hand, across the table the Englishman, respecting all the good manners recognized in well-ordered society, is called upon to respond to a toast, and with the grace of a Chesterfield, he rises to the occasion and in a few well-selected words, he makes his response. The German knows he is not the equal of the race from which this gentleman sprang, and therefore dismisses the subject by saying under his breath "Englander Schwein."

But the English are not swine, neither is your Uncle Sam a bluffer, yet a state of mind has been created and does exist all over the world, including Canada, which prompts the dismissal of a statement, involving big figures or vast undertakings, made by an American, as "American bluff." To this I have applied the test and I

"Force without Stint or Limit to make the World Safe for Democracy
Wilson

GEORGE A. SIMPSON

wish to go on record and state in the most emphatic language that all through the history of the United States I cannot find one instance where statements have been made which I will admit, sounded like "bluffs," that have not been fulfilled. And I can only conclude that the reason the word "bluff" or "bluffer" has been applied by the people of every nation who do not realize the stride your Uncle Sam is making, is because they cannot grasp the magnitude of the statements made and they dismiss the subject as "American bluff," while those who do realize it, resent it with the same remark.

Their Declaration of Independence, whereby they severed their allegiance from a crazy German king, sitting on a British throne, was no bluff; neither was the Emancipation Proclamation, which gave freedom to the slaves, a bluff.

Couldn't Grasp the Idea

As a slight indication of the extent to which the word "bluff" or "bluster" has been applied to the inventive minds and the unbridled energy of the American people and as to how poorly it served as descriptive of their accomplishments, I may state a little incident that I well remember and have many times repeated. I was standing on the railroad platform in Newport, Monmouthshire, awaiting a train to take me to my home. I was then a boy, attending a British Public School. There were a number of other passengers waiting for the same train, among them being the vicar of the parish of Trevethin, the Rev.. J. C. Llewelyn, a well known and renowned clergyman of the Church of England. He was talking to some farmers, who lived in his district, and the conversation ran about as follows: He told them that he had received a letter from a former member of the church, who had emigrated to America, stating that there had been invented and there was now in use in the United States a machine that while being drawn through the field, would cut the wheat, put it up into sheaves, bind it and drop it, ready for being put into shocks, as it went along.

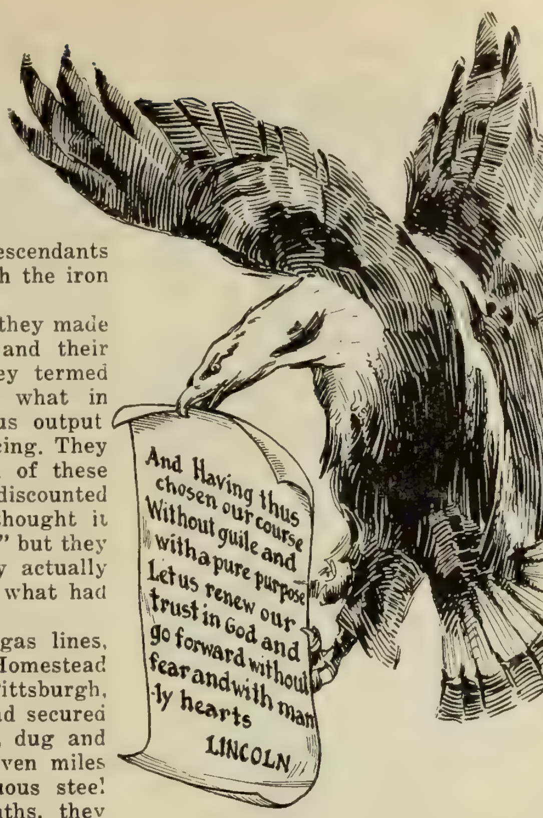
The conversation was interesting to me as, boylike, I had profound respect for the vicar. I now recall the expression of doubt on the faces of the farmers, and the smile from the vicar who acquiesced with their thoughts, and I can now hear him distinctly stating that he very much doubted that such a machine could be made and applied in general use, with which the farmers, who were at that time cutting their wheat with a sickle, were very much in accord.

When we consider what the sons of Uncle Sam have done for the agricultural world and realize that their first attempts were classed as "bluffs," we can more fully appreciate how ridiculous and uncalled for the expression is. And what applies to the endeavors of Uncle Same in the production of agricultural implements applies to everything he has seriously undertaken.

As a boy I went to sea in an English sailing ship, and I remember very well my first introduction to what I then considered "bluff." We had crossed the Atlantic from England to the West Indies with a cargo of coal and had run down to Pensacola, Florida, for our return cargo of lumber. After we had discharged our ballast, we were towed out into the bay where our complete cargo of logs had been rafted and was there awaiting us. I remember hearing the stevedore, an Irishman, by the way, by the name of Pendleton, who had lived the best part of his life in the United States, telling his gang that he expected to load the ship in about three days. While I was a very young boy at the time, I shook my head and if I didn't say "bluff," I thought it. Notwithstanding we were loaded and ready to sail within the prescribed time and we arrived in England some ninety days later, where it took the English stevedore and his force some four weeks to unload what the American gang had loaded in a little over three days. No bluff about that.

Some years later I was on the Isthmus of Panama. It was shortly after the collapse of the French company, who had undertaken to build the canal All the machinery and equipment was lying in idleness and rusting. The isthmus was reeking at that time with yellow fever and disease, and any man who spent much time there took his life in his hand. I was then advised it was impossible to build the Panama Canal, and to drive home this statement, my advisers, pointing to Monkey Hill, which in those days was the famous burying ground of the workers on the Isthmus, said there were more men buried in the cemetery on that hill than there were ties in the Panama railroad. In later years Uncle Sam undertook to "dig the ditch,' and the first thing he did was to clean up the Isthmus from ocean to ocean. The greatest sanitary engineers in the world were put on the job under the direction of Surgeon-General Gorgas, the man who cleaned up Havana, and when this part of the work was done and the Isthmus made fit for a white man to live on, that great organizer, Major Goethals, the canal builder, was ordered by President Roosevelt "to make the dirt fly." As to how well he did this work is now a matter of history; but the facts are the work on the canal, especially any reference to the gigantic dredging operations, were often referred to as American bluff, and when the date set for the completion of the work was mentioned, it usually brought forth the stereotyped reply, "bluff." Nevertheless, the canal was completed and ships passing through it fifteen months prior to the official date set for its completion.

If my memory serves me right, it was in the year 1890 that the British Iron and Steel Institute visited the United States as guests of the American steel manufacturers. At that time I was associated with the T. A. Gillespie Co. We were laying natural gas pipe lines into the city of Pittsburgh and some of our construction records had evidently reached England. When the members of the Institute reached Pittsburgh, it was my pleasure to take charge of a party of six to conduct them through the steel mills at Homestead and, incidentally, outline to them what was being done in connection with the bringing of natural gas into the city. In my party was the president of the Institute, Sir E. Windsor Richards of Middlesboro, Mr. Clement Crowther, of Crowther Bros., Kidderminster, and Mr. Isaac Butler of the Panteg Steel Works, in whose mills I had worked in England, also a number of others, all of whom were descendants of families long connected with the iron and steel industry.


And Having thus chosen our course Without guile and with a pure purpose Let us renew our trust in God and go forward without fear and with manly hearts
LINCOLN

I recall now the statements they made on going through the mills and their utter amazement at what they termed "the gigantic buildings" and what in their minds was the enormous output which these mills were producing. They told me then they had heard of these big undertakings, but had discounted them very largely, as they thought it was merely "American bluster," but they were satisfied that what they actually saw was greatly in excess of what had been reported.

When I showed them the gas lines, which passed very close to Homestead before crossing the river into Pittsburgh, and stated to them that we had secured and cleared the right of way, dug and filled in the ditch and laid eleven miles of 36-inches diameter continuous steel piping in less than five months, they were astounded and Mr. Crowther remarked that at home (meaning in England) they would not have concluded the debate in Parliament in that time as to whether the right of way should be granted or not.

Making of Tin Plate

It was just about this time that the subject of manufacturing tin plate was being considered seriously in the United States, and I so advised these gentlemen, and while they were willing to admit that all the statements that had been made in reference to pig iron and steel had been more than fulfilled, nevertheless it was not possible in their mind for any one to take Great Britain's place in the production of tin plate. They were inclined to jokingly infer that my statements in connection with this industry bore a little resemblance to "bluff." I may state that to-day the United States leads the world in the production of tin plate, likewise pig iron and iron and steel.

There was no question as to the effect of what they saw on the minds of the members of the British Iron and Steel Institute, or as to the benefits obtained through their visit, as they all returned singing the praises of your Uncle Sam and voted unanimously that he was not a "bluffer." And on the Americans, who had come into contact and associated with this magnificent body of representative Englishmen, the impression was indelibly stamped that they were gentlemen in every sense of the word.

I could go on indefinitely reciting statements that were regarded as "bluff," but which were fulfilled to the letter. While the Alfonsos and Isabellas sneered at what they termed "American bluff," your Uncle Sam was not bluffing when he lifted the heel of Spanish tyranny from the neck of the Cuban and cleaned up the Island of Cuba and dredged the harbor of Havana and thereby got rid of the filth of centuries, which made this beautiful island a hot bed of bubonic plague and yellow fever. As a result to-day there is no more beautiful spot on the Western hemisphere than the Island of Cuba and the city of Havana. It is true, while doing his work, he lost by death, through yellow fever, an eminent sanitary engineer, but he completed the job and made good his wildest statements. And what is more—he paid the bill and to-day Cuba is proud to be recognized as a protege of Uncle Sam.

The Boxer Incident

And while I am referring to paying bills, I might state that during the Boxer Rebellion in China, when the six big nations of the world undertook to quell the disturbance, they all went in with the understanding that China would pay full indemnity for every expense incurred in the undertaking. After the work had been accomplished and the civilized nations had withdrawn, which, by the way, does not include Germany, as she stuck and took possession of Tsing Tau Peninsula and refused to be dispossessed, maintaining that she was holding this possession as payment for the expense she had been put to, they rendered their bills—which ran into enormous figures—and all of them are being paid with the exception of the one rendered by your Uncle Sam, which he presented to China marked "paid in full," with thanks for the privilege of being given an opportunity to render such a service to humanity. Surely this is not "American bluff."

The feeding of Belgium in the early part of this war was no bluff; neither is the feeding of the Allied armies to-day, or that part that your Uncle Sam has played in this great war from the beginning. Referring to the feeding of the armies to-day, I am reading from an address made by Sir William A. M. Goode, an officer of the British Food Ministry, before the Consumers' Council, in which he gave striking figures, showing how the people of the United States by self-imposed food restrictions have aided greatly in maintaining the food supply of the armies in the field. Sir William said:

> "From July, 1917, to April, 1918, the United States exported to the Allies 80,000,000 bushels of wheat products. It was calculated by Herbert Hoover, United States Food Administrator, that fifty million of this represented the voluntary sacrifice of the American people. American exports of pork products to the Allies in March, 1918, were 308,000,000 pounds. This was accomplished by porkless days and ceaseless hog production in the United States. In January, Sir William continued, the Allies asked Mr. Hoover for seventy million pounds of frozen beef monthly for three months. In March 86,000,000 pounds of frozen beef were shipped. This was due almost wholly to meatless days in the United States."

Had this statement been made by an American, it would, no doubt, have been dismissed as "bluff."

I would like to furnish some more figures and I would if space permitted, but suffice to say it required more than bluff to supply Great Britain and France with over 1,500,000 horses and mules; millions of tons of steel and shell forgings, hundreds of thousands of tons of barbed wire, and tens of millions of completed shells, machine guns, revolvers, together with hundreds of millions of pounds of powder and cordite to assist in delivering these shells into the ranks of the Germans by way of British guns. Add to this the enormous quantity of machine tools and equipment that was shipped to England and France, which enabled them to speed up and take care of their own requirements. Add to these transports, trench diggers, tanks, automobiles, medical supplies, clothing, shoes—in fact, mountains of supplies—that were absolutely necessary for the very existence of the allied armies in the field. We grant he was paid for all this, but that he was entitled to. What I wish to bring to your notice is the magnitude of this undertaking and the manner in which it was carried out, and many times during the early period of the war I heard statements made by these American producers, who had undertaken this magnificent work, referred to as "American bluff."

Some 1918 Accomplishments

The building of the Liberty Mill at Homestead in six months for the rolling of ship plates, the construction of a one-hundred-million-dollar ordnance plant on Neville Island in the Ohio River, near Pittsburgh; the building of shipyards from ocean to ocean with seven hundred and twenty ship-building berths and the launching of ninety-four ships on the Fourth of July are merely incidents in the vast war programme mapped out by Uncle Sam. Yet any one of these undertakings is stupendous. They form parts of the American war machine, and you can take it from me that when this force gets properly started, there is no power on earth can stop it. It is no bluff; it is Uncle Sam's contribution to a righteous cause, and shoulder to shoulder with his Allies, he will drive this machine across the Rhine.

While I know from experience that the great majority of Canadians fully realize and appreciate that Uncle Sam is a good neighbor and that he is not a bluffer, I also know there are small cliques of narrow-minded individuals in Canada, who are earning their Iron Crosses and doing good work for the Kaiser by sneeringly applying to all things American the word "bluff" and thereby attempting to discount their most sincere efforts. Such individuals should, in my judgment, be reported to the proper authorities, where they would be given an opportunity to prove whether their remarks were merely expressions of their personal opinions, or whether they were paid for with German gold.

The Wrong Viewpoint

An incident I shall ever remember and long regret happened on a train some months ago. I was sitting in the parlor-car. We were leaving Hamilton, going to Toronto with a friend, and across from us sat the president of a large Canadian manufacturing company. He was reading a Buffalo paper and evidently some of the headlines did not please him. Handing the paper to me, he pointed to an article and remarked: "What do you think of that American bluff?" The article referred to a loan of a few billions to the Allies and incidentally spoke of helping to deliver the punch that would knock out the Hun. I saw nothing objectionable in the article and called his attention to the fact that he was reading an American newspaper, and I further stated that, in my judgment, the help we would get from Uncle Sam was necessary and that had the United States not entered the struggle to take the place of recreant Russia, Germany might have forced a peace of her own devising upon the Allies, to which he objected, stating definitely that he would rather see the Allies beaten than have that bluffer take any of the credit. The cruelty of this remark was sufficiently effective to stun both of us, to whom it was directed, and while we felt like beating him up, or handing him over to the police, we ignored him; but not without taking his mental measure and concluding he was either crazy or profoundly pro-German, preferably the former.

I fully realize that Canada could exist without her neighbor; but it would not be a very modern existence, neither would it be a very progressive one. But I also realize that we can get along much better with the United States than without. We are absolutely dependent on Uncle Sam for a whole lot of our comforts. Take hard coal for one—yet notwithstanding there was a great shortage last year due to the war, it is a fact, the homes of Canada were more comfortably heated than the homes in the United States, and I know that the orders from Washington relating to the distribution of certain materials were positive, as a prominent official there told me that Canada was being treated as one of the States. This spirit prevails and governs the actions of Uncle Sam in all his dealings with Canada.

Canadians should not forget that Anglo-Americans wrote the Declaration of Independence and the Constitution of the United States; they produced George Washington, Abraham Lincoln and Woodrow Wilson; they were the makers of trails and the givers of laws; they opened up the American wilderness; they drove the roads and bridged the streams and the roads they drove were straight and the laws they gave were broad and kind, and to-day the eyes of the world are looking west for they know that your Uncle Sam is not a bluffer. They are beginning to realize what America stands for.

Finally, I ask for no more sincere and representative corroboration of the truth of my statements than the tribute recently paid to your Uncle Sam by the Earl of Reading, British Ambassador to the United States, which follows:

Associated Press Despatch.

LONDON, Aug. 14.—The Earl of Reading, British ambassador to the United States, in a lengthy statement to the press, details America's war work as he has observed it during the last six month.

"If I speak in terms of enthusiastic admiration it is because none other would convey my thoughts," he says.

After discussing America's achievements in feeding the Allies and building ships, Lord Reading continues: "In no direction, however, is the spirit of the whole-hearted co-operation more striking than in the magnificent contribution of America to the man-power of the Allies. When in the grave anxieties of the end of March at the request of the prime minister and the cabinet I asked the President to order without delay the acceleration of his despatch of American troops and to allow them to be trained and used with the British and French, his only limitation as to numbers was the shipping capacity to carry the men.

Gave Allies Initiative

"It was an historic moment which may in the future be regarded as the turning point of the war. Both the British and French nations were quick to appreciate the spirit of this contribution made so promptly and at so opportune a moment. It has proved of such value that Marshal Foch has been able to meet the great German attack by an Allied counter-offensive and has not only wrested the initiative from the enemy, but has gained important victories.

All Resources Thrown In

"Since America has acquired knowledge of the situation her material resources, financial wealth and the brains and force of character of her millions, in fact all the physical and moral forces of this giant among nations are turning in one direction—to the attainment of victory. Americans are idealists but they also are business people.

"Having realized what victory and failure will mean to humanity, with their characteristic single mindedness and power of concentration they are making the winning of the war their only business and, if I know anything of them, having undertaken the task they will persevere until their object is achieved.

"I wish I could adequately convey to the British people the warm-hearted generosity of my reception as British ambassador by the American people. It is given me as British representative and is an expression of the admiration of Americans for the part played by the British people in this war. Prejudices are giving way to a better understanding of the ideals animating both the American and British people, ideals that will carry them along the same road in the same direction in whole-souled co-operation for the progress of humanity and the peace of the world."

The Spirit of America

My message is prompted by the most sincere thought and best wishes, because I want Canadians especially to know what the spirit of America is. I want to get into their very souls the passion and love for the sons of Uncle Sam that the sons of Uncle Sam have for them. I want them to understand that their heart is as great as the nation over which their emblem of liberty flies, and what is more, it beats true and in sympathy with all that can be termed human fellowship. It is consecrated to the highest ideals of humanity in its noblest form. The spirit of America is liberty, but it does not invade the rights of others, for it well knows that to enjoy liberty, it must extend it to others. It pleads for the rights of men to think, to reason, to investigate to the end, that the future may be enriched with the thoughts of honest men. It implores every human being to be a soldier in the army of progress, and it extends to him every right it claims for itself, believing that when all men give to all others all the rights they claim for themselves, the world will be civilized. Uncle Sam has had his difficulties, but they have stimulated, rather than stifled, his energy and the spirit of America, born of liberty, justice and truth, has surmounted a greater variety and combination of obstacles than I believe ever fell to the share of any one people in the same space of time, and to-day it is returning to the world the fruits of the belief that the universe was planned for good and the blessings of Creation were intended for the admiration and benefit of all mankind.

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LIQUID OXYGEN EXPLOSIVES

By M. M.

The Germans have devoted considerable attention to the use of liquid air for blasting purposes and the Sprongluft Gesellschaft o.b.h. possesses plants capable of supplying 22 lb. of rectified liquid oxygen per hour at a net cost of less than 1d. per pound. The liquid oxygen is stored in a modified Dewar flask, usually of brass or thin steel, the jacket space being filled with charcoal, which absorbs any small amount of gas escaping through the pores of the metal. In utilizing the liquid oxygen for blasting, lampblack has been found the most satisfactory combustible material. Cartridge cases of cardboard are filled with the lampblack and then immersed for some time in a tank containing the liquid oxygen so that they become thoroughly impregnated just before use. They are usually fired by a small primer, preferably ignited by electricity. Oxyliquite is stated to be very efficient for mining work on account of its brisant qualities, but is less suitable for quarry work. It is considered safer than the explosives generally used, since the cartridge is only explosive for ten minutes after the time of saturation with the liquid oxygen. This fact, however, makes it necessary to instal a liquid oxygen plant near the scene of operations.

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COMPOSITION FLOOR TO TAKE NAILS

By T. H.

Of the many attempts to produce a plastic floor composition, hard and durable, easily moulded, of any suitable color, and capable of receiving nails, etc., by means of which objects can be fastened to it, the latest is that of Messrs. R. G. Phillip and W. H. Poole, according to whose recently patented method specially shaped steel sheets are laid on joists and in themselves form keys for the composition to grip, and also form a key on the under side of the plaster. The plastic composition is rendered on the sheeting and finished with a composition mixed in rather different proportions to the rendering or base, the result being an efficient hard wearing flooring. The composition may be made damp and acid proof, and may be polished. Should wear take place a new covering or finishing layer may be added. The rendering composition is in the following proportions: 14 parts of cement, 2 parts sawdust, 1 part magnesium chloride saturated with solution, 4 parts of iron pyrites residue (formed from burning iron pyrites in the production of sulphuric acid) with a suitable proportion of oxide coloring material. This latter may be obtained by adding sodium ferro-cyanide to a dilute solution of copperas, acidified with sulphuric acid, and after decanting the liquid the white precipitate of ferrocyanide is oxidised with nitric acid. The finishing composition will vary, but may contain substantially 14 parts of cement, 1 part sawdust, 1 part of magnesium chloride solution and 1 of pyrites residue with rather more of the coloring matter. To render it water and acid proof oil may be added or the finished face dressed with oil. A suitable acid proofing would be a solution of 7 parts of paraffin to 10 parts of petroleum jelly, heated to a temperature of about 104 deg. Fahr. and applied whilst warm.

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CEMENTS

By M. E.

Cements as manufactured are composed of finely ground lime or other substances, which are either mixed with or without other materials to enable them to set with the addition of water. They are usually divided into natural and artificial cements. Roman cement, a hydraulic argillaceous limestone, and gypsum, a sulphate of lime, are natural cements: Portland cement, slag and similar cements, also plaster of Paris, are artificial cements, including Keene's, Parian, etc. Roman cement is a natural hydraulic cement found in various argillaceous limestone situations throughout the world; its color varies, being blue, red, or brown, according to the presence of oxide of iron. The stone after calcination is finely ground, the quality depending on the quality of the stone used, and the care taken in grinding, and it loses one-third of its weight in the burning process. It is usually of a dark brown color, and is an admirable cement for damp situations; is useful in repairing work as it sets quickly and can be painted upon at once. Thus it is useful for cement cast work, although the quick setting properties necessitates much attention in its manipulation. Sheppy cement and Medina cement are made from better qualities of limestone but their qualifications are identical, being useful for outside work, as is also Birmingham waterproof cement. Portland cement is an artificial hydraulic cement. Generally when being manufactured a proportion of clay, chalk and lime is put into a mill with sufficient water to form sturry, which is allowed to dry, and is afterwards taken out and burnt; the clinker formed is placed in a crusher and finally ground to the required state. Users of Portland cement should be able to judge between a good and a bad cement. Well burned, heavy, finely-ground, slow setting cements are the best, and if not finely ground its carrying capacity for sands, etc., will be low.

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FOUNDRYMEN WILL GATHER IN MILWAUKEE

(Continued from page 194)

Henry E. Pridmore, Chicago.
Progressive Metal & Refining Co., Milwaukee.
Quigley Furnace Specialties Co., New York.
Racine Tool & Machine Co., Racine, Wis.
Richards-Wilcox Mfg. Co., Aurora, Ill.
Rivett Lathe & Grinder Co., Boston.
Robeson Process Co., New York.
Rogers, Brown & Co., Cincinnati.
Sand Mixing Machine Co., New York.
Schroeter Engineering Co., Chicago.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Simonds Mfg. Co., Fitchburg, Mass.
W. W. Sly Mfg. Co., Cleveland.
R. P. Smith & Sons Co., Chicago.
Werner G. Smith Co., Cleveland.
Southworth Machine Tool Co., Portland, Me.
Standard Optical Co., Geneva, N.Y.
The Standard Sand & Machine Co., Cleveland.
Sterling Wheelbarrow Co., Milwaukee.
Frederic B. Stevens, Detroit.
W. F. Stodder, Syracuse, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Sullivan Machinery Co., Chicago.
Swan & Finch Co., Chicago.
Thomas Elevator Co., Chicago.
Torchweld Equipment Co., Chicago.
United Compound Co., Buffalo.
United States Graphite Co., Saginaw, Mich.
U.S. Molding Machine Co., Cleveland.
U.S. Smelting Furnace Co., Belleville, Ill.
United States Silica Co., Chicago.
Wadsworth Core Machine & Equipment Co., Akron, O.
J. D. Wallace & Co., Chicago.
Warner & Swasey Co., Cleveland.
Western Electric Co., New York.
F. H. Wheeler Mfg. Co., Chicago.
Whiting Foundry Equipment Co., Harvey, Ill.
E. J. Woodison Co., Detroit.
Young Bros. Co., Detroit.

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Change in Name.—The National Boiler Seam Protector Co. of Canada has changed its name to the National Boiler Co. of Canada, and changed its head office from Montreal to 70 Lombard St., Toronto. A branch office is located at 128 Bleury St., Montreal. Mr. Wm. E. Holder the general manager has moved from Montreal to Toronto.

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When I don't know whether to fight or not, I always fight.—Nelson.

FOR THE MAN WHO WORKS IN THE SHOP

Different Methods of Molding Large Kettles

Toleration Necessary in Approaching Any of These Matters—Detailed Description of the Way in Which Work on Kettle Was Done—Satisfactory at Last After Failure

By B. FRELL

EXCHANGING each other's views is an admirable way of arriving at the best method of doing work, but we must do it amicably and not be too sure that we are the only ones who know how to do work right. I will explain a little experience which I had in my younger days. It came vividly to my mind once when I read a controversy in an American trade journal and it has come to my mind again at this time. The controversy will perhaps be best explained first. It was over the molding and pouring of a large kettle. We all admit that kettles are best poured bottom down, because the metal is more dense and close grained at the bottom than at the top, and it is the bottom which requires to be the best. If we have a good pattern and an anchor or basket to lift the inside, it is just as easy to make them bottom down and perhaps a little bit easier. But in the case referred to the foundryman had an order for just one kettle of considerable proportions and he had no equipment of any kind, so he figured that he could make it to best advantage bottom up in loam and he proceeded to explain in detail how he did it, with the result that he got a first class casting.

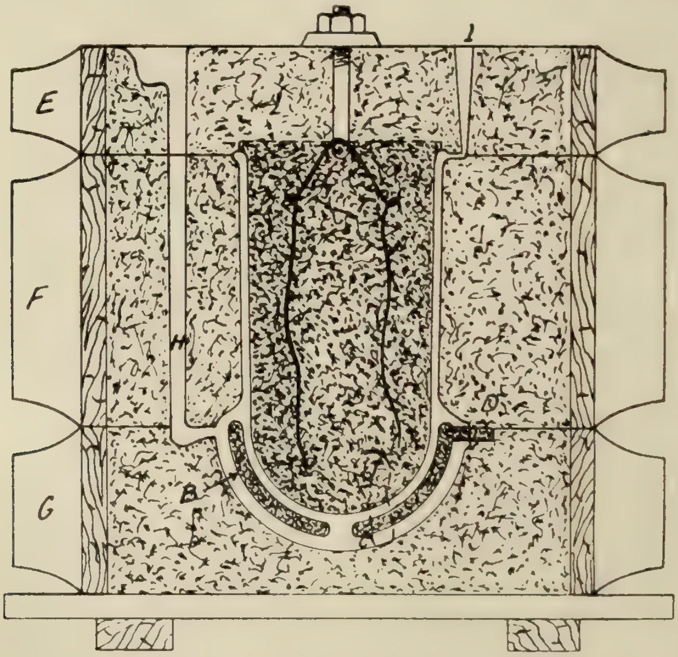


FIG. 1—MOULD FOR CAST IRON GLUE KETTLE.

Then Came The Bricks

He was so pleased with the result of his economical method that he concluded to give it to the foundrymen who were doing similar work in a more expensive manner. His good intentions were evidently not received by everyone in the manner he might have expected, because in the very next issue of the same journal was a reply from a foundryman who did not agree with him, and he emphasized his disagreement by saying that if he ever made a kettle in that manner he would be ashamed to tell anyone, much less would he be likely to describe how he did it.

Both Got Good Results

Now here were two very divergent opinions on the same subject by two good men. Of course, the second man went on to explain how he would do it. This would be rather confusing to a molder who would be trying to learn from the paper how to make a kettle, but still it would be showing up the two systems, both of which had proved successful, and he could use his own judgment as to which would be the most suitable in his particular case. The experience which I had was with a small kettle, (Fig. I), weighing some four hundred pounds. It was for mixing glue or something of the like and had a water jacket (B) on the bottom and up the sides a little way. The sides were about half inch in thickness and the inside bottom would be probably three quarters, while the bottom outside of the jacket core would be about an inch. There was evidently some mechanism to work inside of it because the center of the bottom had to be reserved for a pivot, but under it and extending a little to one side was a solid boss (C) which connected the two thicknesses of the bottom and of course projected through the jacket core (B), which was about an inch in thickness. This boss would be about six inches one way and about three inches the other way and about three inches thick. It reached to one side so as to be bored through for a tap to draw the contents from the inside. I was an advocate of the bottom down system and made it that way.

How The Work Is Done

There is little to explain about making the mold. The pattern was parted at (D) and at this parting there were three round outlets from the jacket, to attach pipes to. These were the only places at which the vent could be taken off of jacket core. I made an oil sand core and it gave no trouble. I made the mold in a three-part flask as shown in Fig. 1, lifted off cope (E) and drew the straight part of the pattern and then lifted the cheek and drew the balance of the pattern. The gate (H) extended down to the bottom parting where I cut the runner. The overflow riser (I) was cut on the upper parting. The jacket core (B) was placed on the drag and vents were drawn over the parting to the outside of the mold. I had a dry core for the entire inside of the kettle and I stood it on the floor and let the cope down on top of it and bolted it secure, after which I raised the cope and core and let them down on to the cheek (F) which was on a pair of horses. This was so that I might see if any harm was done by the core in passing through. After this I lifted the both parts together and closed them on to the drag, clamped up the mold and poured it.

All Went Off Well?

Everything worked to perfection. The vents got away all right and the casting, when taken out next day, looked to be perfect. I thought I had been remarkably successful, but when the casting was fitted up and that big boss (C) was bored out, it leaked and the water in the jacket would run out, so we had to smash it, and we found the inside of the boss all pulled to pieces just like a sponge. I made another same way and it came out the same, so I put bars in the drag and made it the other side up and had no trouble. I concluded that the sides being the lightest cooled first and settled evenly from the top, and when the bottom cooled it had nothing to draw from excepting the boss, and when boss, which was the heaviest, and consequently the last to cool, finally solidified, it had nothing to draw from, and being badly bled already, and the shrinkage which it would have to undergo in itself, it was left in the condition described.

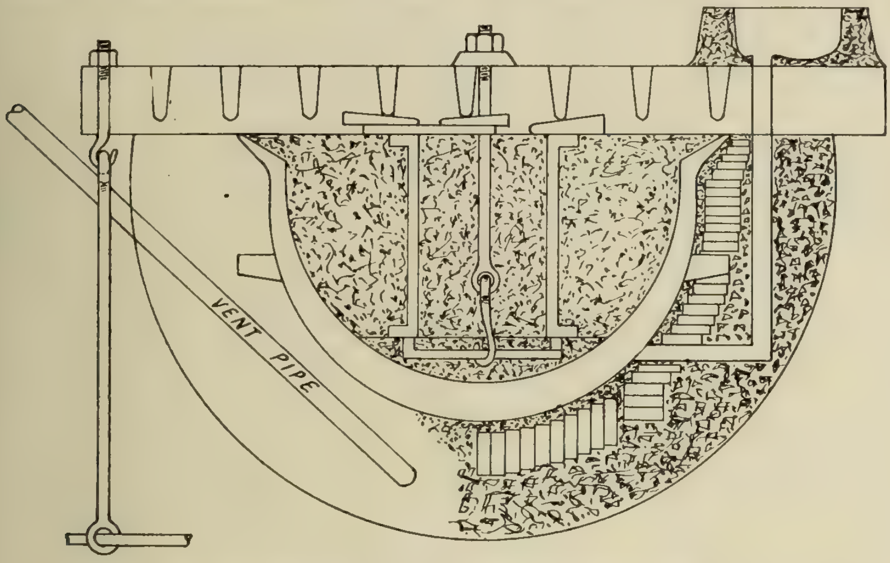


FIG. 2—BUILDING UP LOAM MOULD FOR KETTLE

The Other Way

By making it the other side up the sides cooled first, and had the heavier bottom to draw from, and when the bottom cooled it had the still heavier boss to draw from and when that part had to have metal to draw from, a riser which I had placed on top of it supplied required metal. I learned a lesson from that bit of hard luck and have often benefited from it. However, I am not ashamed to say I made it that way. The one which was poured bottom up was a good casting and was accepted by the customer, while the ones which were poured bottom down were scrapped. This has been my experience. I thought afterwards that if I had placed a blind riser as at (J) I might have saved it, but it would have left a nasty scar in a place where it would be hard to chip off.

Great Faith In Riser

Whenever I have a pattern with uneven thickness I want the thickest part where I can get at it with a riser even if I do have to put the heavy part higher up in the mold than the lighter. If a casting such as a kettle is poured bottom down and the iron is dirty, some of the dirt will lodge under the core and the outside will be cleaner than the inside. However, I still believe in making kettles bottom down when practicable, but when a man finds it to his advantage to do otherwise as did the man in the American publication or as I did in the foregoing article, I do not condemn him.

We should size up each job and make it whatever way seems best. If I should be called upon to fill an order for just one kettle of the ordinary round bottomed type such as is used in the manufacture of chemicals or for boiling potash, I would make it bottom down and sweep up the outside in loam and the inside I would ram up in sand and skin dry it. I don't care how heavy the kettle is a mold of this kind will hold it. The first thing I do is to dig a pit of the same shape as the kettle and about a foot bigger all around, as well as deeper. Then plumb up the spindle (Fig. 3) and firmly secure the step (b). It is well to have the top bearing (c) secured to a bracket from the wall. Some molders depend on the bottom bearing. After the spindle is in proper position ram in a coke bed up to about five inches from where you want the bottom of the mold. Then attach the sweep board (D) to the spindle, as seen in Fig. 3, and build the bricks up to about half an inch or a little more from the sweep. Use wet molding sand to build the bricks and always keep the edge of the brick towards the sweep, being careful to keep the bricks tight against the coke bed. Vent these mudded joints well with a fine wire down to the coke.

The Rest of the Building

When you get away from the bottom and get working up the sides, build the brickwork first and put the coke in afterwards. I do all of the brickwork and pound in all of the coke before putting on any of the loam, so that if a brick should be loosened it can be attended to. Pound the coke in hard enough so that there will be no need of any other backing. After this is done spread on the coarse loam, beginning about where the gate (F) Fig. 2 is shown and work up to the top after which do the bottom. If I did the bottom first it would be all messed up with the falling loam from the sides. When this coat of loam is finished rub it over with charcoal dust or partimol and let it stand over night to dry out a little. Then remove the sweep board D, and attach sweep board E (Fig. 3) and sweep up a thickness of molding sand mixed with clay wash, and then remove the sweep and spindle and build a fire to dry the mold enough to ram onto. The coke around the outside being exposed on the top permits the steam to escape. Next ram sand on top of the coke, and strike it off level and make a parting. The rest of the job is the same as any green sand or skim dried mold. If I have an anchor similar to Fig. 4, I use it to lift the inside. If it is not the right curve I use gaggers to make up the difference. If you have no such anchor, mix up sharp sand and linseed oil to consistency of fairly wet core sand, and make a core right in the bottom. Have this core well rodded and have a clamp bedded into it with the toes level with the surface of the core. This will set itself in a few hours so that it can be lifted out and dried in the oven.

Protecting The Core

When using the core for an anchor, supports should be placed between it and the bars of the cope so that the core will not be strained when bolting it to the cope. When the cope carrying the inside is lifted, the thickness is removed from the drag and the loam surface is

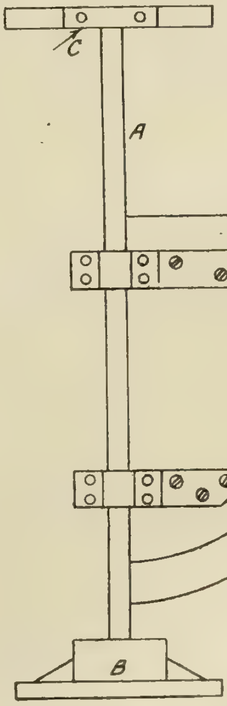


FIG. 3—SWEEP.

brushed clean and the finishing coat of loam is put on, preferably by replacing the sweep but not necessarily.

Both parts of the mold will be finished and blackwashed. The part which is made of sand will be skin dried to a depth of about an inch, but a loam mold must be thoroughly dried.

I think I have made this plan enough for a molder to understand, if he is experienced enough to mold it in sand from a wooden pattern. The thickness swept up with the sweep E (Fig. 3), takes the place of the wooden pattern. The gate cores are the same, being built into the brickwork and projecting far enough to connect with the upright, which may be a continuation of the core, or it can be made by standing a gate pin in the core and ramming it up inside of a piece of pipe. The vent is carried away from the coke bed by means of pipe the same as in all work. The cope is held down by bolting to anchor irons in the floor. If no anchors are in the floor, weights will be used, but it takes an enormous weight to hold down a kettle. The facing for dry sand does not require sea coal. One part of new sand to two of old, mixed in the proportion of one to twenty with flour and tempered with thin clay wash is what I use and it works well. For loam I use one part of new molding sand to two of sharp sand mixed about one to four with horse manure and tempered with good stiff clay wash. It is a mistake to think that horse manure is put in as a bond. The clay is the bond and the horse manure is to open up the grain in the clay in order to give it vent. For finishing coat of loam I run some of the ordinary mixture through No. 8 sieve. For black wash I mix charcoal dust and plumbago and wet it with thin clay wash with a little molasses in it. Thick clay wash is worse than nothing. It shrinks and flakes off, but thin clay wash has always worked well with me, particularly where there is no dampness.

VARIOUS TYPES OF SKIMMING GATES USED FOR DIFFERENT WORK

By CORESAN

I WAS greatly interested in the last issue of THE FOUNDRYMAN, particularly in the article relating to the fluxing of iron. I am sure that limestone does a lot of good in purifying the iron, and I am also confident that it is profitable to use fuel enough to have the iron melted white hot, as by so doing it is cleansed to a considerable extent, but my experience has taught me that do what I will the iron will be dirty anyway.

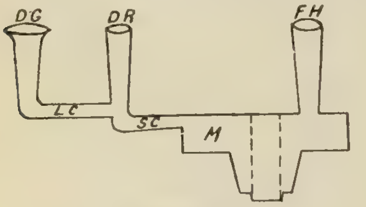
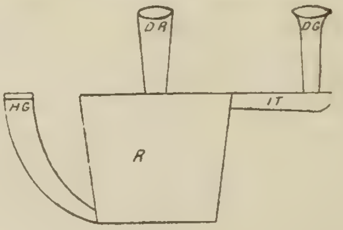


FIG. 1—SKIMMING GATE.

As we have all been taught, pure iron is impossible, and it is the impurities in it which makes it usable, and the impurities will continue to disconnect themselves from the iron as long as it is in a fluid state. I have taken iron which was melted as clean as any one could wish for, and I have skimmed it off perfectly, and have poured it through a skimming gate similar to Fig 1. The iron is poured into the down gate DG, and from this it travels through a fairly large channel LC cut in the cope to the dirt riser DR, thence through a smaller channel SC cut in the nowel to the mold M. By forcing it through the large channel it can not go through the small channel so readily and as a consequence it goes up the dirt riser.

By this means we have a column of metal the height of the dirt riser and expect the cleanest iron to flow from the bottom and the dirt to rise to the top, which it does, and I have seen a lump of dirt as big as an egg on top of the riser, and yet on looking down the feeding head would see dirt floating around in the mold. Of course there would not be so much as there would have been without the skimming gate. A somewhat better skimming gate is shown in Fig. 2. The metal running from the down gate flows through the intake channel (I T) into the receiver (R) and can go no further until the receiver is full, when it will flow from the bottom up through the horn gate (h g) into the mold. With this style of gate it is not necessary to force the metal, because when the receiver is full it stays full even if the pouring is stopped, and according as the metal is poured in, the clean metal flows up from the bottom through the horn gate H A and the dirt remains on top of the metal in the receiver.

FIG. 2—BETTER ARRANGEMENT.



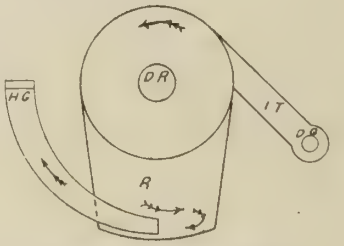


FIG. 3—WHIRL GATE.

Another Type of Gate

A still better skimming gate, and what in my mind is the best that can be produced, is the whirl gate (Fig. 3). It is similar to Fig. 2 but has the intake (I T) on an angle so that the metal iron on entering the receiver whirls around, forming an eddy which tends to separate the dirt more rapidly than would otherwise be the case. The centrifugal force thus created throws the heaviest part, which is the iron, to the outside and the lighter material, which is the dirt, goes to the center where it can easily go up the riser. It will be noticed that the horn gate (H A) Fig. 3, is also on an angle pointing in the same direction as the intake (I T) but on the opposite side, and the whirling iron will not enter it but will pass by until the receiver is partially filled, when the metal in the bottom will be comparatively still and will reverse its course before entering. From this it will be seen that the first iron entering the receiver, and probably carrying dirt with it, cannot get into the mold. To make a gate like Fig. 3 it is necessary to make a wooden pattern of whatever size is desired. The intake gate (I T) is attached to the receiver and the horn gate (H A) is loose and fitted with a shoulder cut into the small end of the receiver pattern. From these patterns any number of metal ones may be cast. In using this gate is placed reverse side up on the follow board in any convenient place in the mold and when the patterns are drawn gates are cut from the horn gate H A to whatever is to be cast. This style of gate is not well suited for very large work but I have used as many as four on one piece and have poured extra ladles of iron by simply emptying one and taking it away and bringing another in its place, as has already been pointed out. No harm comes from stopping and starting again excepting that it is apt to cold shot the casting if delayed too long. If the iron is sufficiently hot it will flow through faster than if it is dull and will give the whirling motion a better chance to do its work, because the faster its motion the more thoroughly will the heavier and lighter material be separated. Of course good, clean, hot iron is of first importance but a good gate along with the good metal should produce still better results.

LINSEED OIL A CORE BINDER VERY GOOD FOR SPECIAL WORK

By F. B. ELMER

IT has been said of linseed oil that it created no gas and that cores made with it as a binder required no venting.

I have even heard it said that such cores could be entirely submerged in the iron and cause no trouble. I will not go this far in my good words for it, but I will say that it suits me better than anything I have ever used if I have a real complicated casting to turn out. For simple cores it is not to be recommended, as it is too expensive, and the core maker can not make speed, but in places where other kinds of binder would require peculiarly shaped rods and arbors, they can frequently be dispensed with when linseed oil is used, and for very thin cores where there is not the room for rods this kind of binder will hold them up without rods. In places where it is difficult to get with the vent wire, venting can be slighted to a greater extent than with most binders. Oil cores can be stored for unlimited time and take no harm from dampness, and can be handled roughly without chipping the corners. All things considered a core properly made with linseed oil as a binder has all the good qualifications which a core should be expected to have.

The objectionable features are found in the making of the core. To make good linseed oil cores, only pure sharp sand should be used, and to be sure that it is pure it is best to burn it to remove any vegetable matter which might be in it. This can be done by pouring melted iron into it. None can be mixed ahead of time as it sets rapidly. When cores are to be made, the required amount is to be measured out and sifted and wet with the oil to about the same degree of dampness as any other core sand. In this state it has practically no strength or adhesive qualities, and cores made from it must be perfectly bedded and banked with molding sand to keep it from falling down or changing its shape. When placing it in the oven great care must be exercised as the least jar will crack it. When it is drying it is even worse. The oil melts from the heat and becomes thinner and has a tendency to flow, and as the molding sand, which was used to bank the core with dries to dust the weight of the core tends to crush it and falls to pieces. This must be guarded against. In fact the making of a linseed oil sand core is about the meanest job a core maker has to do, but once completed there is nothing beats it. It requires a hot fire to dry this kind of core. It is not like drying the water out of other cores, but when thoroughly dry there is no kick to it, it keeps its shape and is easily removed from the casting.

COMPUTING THE MOMENTUM OF MELTED IRON ENTERING MOLD

By A. M. OLDER.

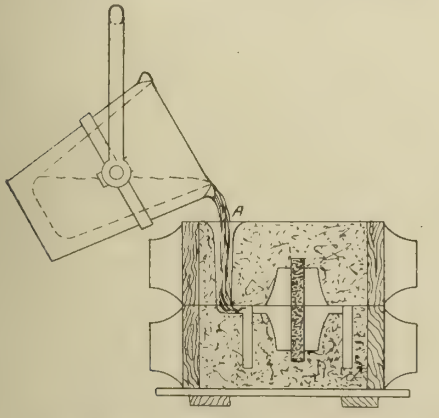


FIG. 1—MOLD GATED WITH STRAIGHT GATE.

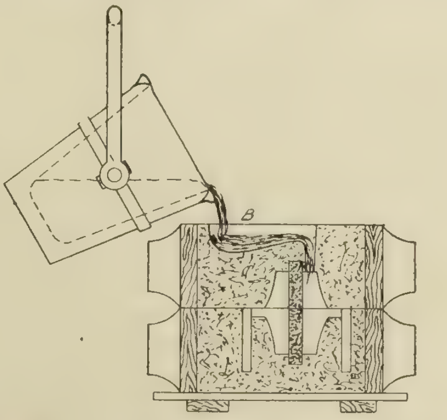


FIG. 2—MOLD WITH BASIN OR RUNNER.

WHAT is momentum? How many molders have ever given it a thought? It has a similar meaning to impetus—the quantity of motion in a moving body. This is always proportioned to the quantity of matter multiplied into the velocity. A heavy body and a light body having the same velocity would not have the same momentum because the lighter one would be more easily stopped. Velocity caused through gravity is increased in proportion to the height from which the body falls. Therefore the higher a body is raised before being released, the greater will be the momentum. Thus, supposing we have a mold (Fig. 1) gated with a straight gate A standing perpendicular and we pour the molten metal right down the gate, the momentum of the metal might easily raise the cope enough to make a fin if we do not cut very quick when the mold is filled.

Now, suppose we raise the ladle high above the mold and pour down the gate A, the momentum of the metal would probably be so great as to raise the cope sufficient to permit of the metal running out at the parting, no matter how carefully we cut it.

Now, supposing we have a similar mold Fig. 2, but instead of pouring directly into the gate, we build a basin or runner B on top of the mold and leading to the gate, the momentum of the metal is lost when it enters the basin. The instant it strikes the bottom of the basin it comes to a dead standstill, after which it rolls upward and in every direction excepting downward until it flows over the gate where it falls of its own weight, and enters the mold with very little velocity. And all the strain which has been created is the statical pressure to the square inch of .26 multiplied by the height of the gate and runner, plus the slight impetus gained in a fall of this distance.

Molders know this: They know that if the mold is not taking the metal as it should, they can force it to do so by swinging the ladle over the gate and pouring direct. Yet it is not an uncommon sight to see a molder pouring a mold and having the lip of the ladle right at the runner, and the crane man raising it just enough to keep the lip in the same place.

All this is folly. It is well to start pouring as low down as convenient in order to save the basin and to avoid splashing, but once the basin is full the ladle can be raised to any height and do no harm in the way of straining the mold. Nothing is gained by raising the ladle too high, but certainly nothing is gained by having it too low. Runner boxes have been knocked off by the ladle, causing the casting to be lost, runners have been drained out, allowing dirt to get into the mold, because the crane man could not hoist up fast enough, while obstructions in the way of pouring might often be out of the way if the ladle were raised a little. Obviously it would be better to always place the ladle where it will be the most convenient for pouring, regardless of its height above the mold.

◆

Turning Out Forgings.—The British Forgings, Ltd., of Toronto, are producing 6,500 shells a day and manufacturing 450 tons of steel a day by their electrical process, more than is made in the same time by the electrical process in the whole of the United States. This was one of a number of interesting statements made by E. L. Cousins, of the Toronto Harbor Commission, in an address to the members of the Kiwanis Club. Mr. Cousins was dealing with the work of the Harbor Commission, and referred to the British Forgings as only one of the new plants made possible by the harbor improvements of recent years.

THERE ARE DIFFERENT WAYS OF MOLDING THE SAME PATTERN

By IRON MOLDER

WHERE I am employed we have a casting which we frequently make. It is about four feet in diameter and eight inches in depth and is like a shieve, but it is part of a machine. I have endeavored to show something of what it is like in the sketch, Fig. 1. The pattern parts at the bottom flange. We have a nice three-part round iron flask. The cheek part is double flanged inside as shown on left side of sketch. These flanges act as supports for wooden chucks, which we place about five or six inches apart all the way around and which project into the groove of the pattern. It makes a good, safe job of it, but it represents a lot of work placing these chucks, as well as the cost of the lumber. And, of course, they have to come out when the casting is being removed from the mold. Some of them can be used again, but a goodly number are spoiled each time.

On general principles I would consider it a good system of molding and can recommend it, as I have never seen one lost, but it so happened on one occasion that we simply had to have two of them at the same heat, and being a graduate of a foundry where "make shift" was all we ever had to fall back upon, I was chosen to rig up some way of getting the second one.

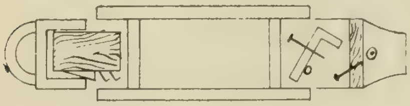


FIG. 1.

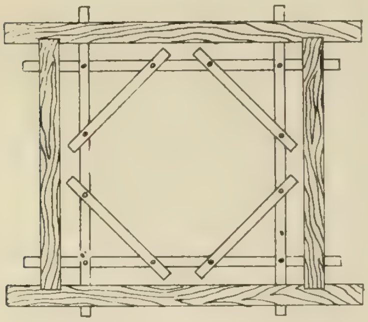


FIG. 2—PLAN OF FLASK.

I just got a two-part square wooden flask of the proper size and used it for cheek and cope, I bedded the bottom flange in the floor and cut a flat parting on to which I staked the cheek. Instead of attempting to fasten chucks to the cheek, I bored inch holes through the sides and ends, through which I inserted inch rods of iron, as shown in sketch, Fig. 2; also under gagger on right of Fig. 1. On top of these I laid four short rods to complete the circle, as also shown in the sketch. After putting on the facing sand I bedded in gaggers about four inches apart resting over the rods as shown to the right of Fig. 1. Gaggers placed this way are perfectly secure. They can neither sag, slip, or turn. The remainder of the mold was done the same as always.

I might say that I put in occasional spike to secure the top part of the groove, and also drove some nails around the inside of the cheek near the bottom to assist in holding up the weight of the sand. I got this mold made in less time than was required to make the other, and I actually believe I am safe in saying that it is the quickest way.

I have molded all kinds of shieves and drums and pulleys this way, and in fact anything which requires to be checked off can be secured with rods. A common way of doing is to have all kinds of boards and sticks nailed into the flask and have nails projecting from the boards and sticks to help hold the sand, and when casting is to be taken from the mold it is another big job with sledge and bar. All that has to be done with this system is to take the tongs and pull out the rods, and then the cheek can be lifted off with ease.

THERE ARE FORTY EXCUSES TO BE USED FOR POOR CASTINGS

IN the June issue of your paper you gave a list of excuses which molders have for making bad castings. Of course it was in a way intended as a joke and molders being a good natured bunch take it good naturedly. They know how convenient it is to have this list to fall back upon when they see their bad work. Looking at it from the joke standpoint, when a molder comes into the shop in the morning, and sees a bad casting lying in front of his floor, he gets out his list of forty excuses and selects the one which looks most plausible, and hands it to the foreman after receiving his anticipated call down. But there is a more serious side to such a question. Is it right to call it an excuse when a man explains how he came to lose a piece? Any one of the forty in that list can safely be used, and not be termed "Excuse." The one which I wish to consider this time is the one of "Poor Sand." Is there anything which is more exasperating for a molder to put up with than to be expected to do good work with played out molding sand? It is not my purpose to try and explain how to overcome the difficulty. That is beyond me. When I have to work in poor sand I have the same trouble as everyone else. But I would like to point to the fact that dirty iron in the castings can frequently be traced to the use of bad sand. Castings which have been made with the greatest of care and poured with good iron will, after being machined, be dirty, not only on the top surface, but down the sides. There will be cavities filled with gritty stuff like cinder, which is nothing but oxidized sand. Supposing a mold is made in good average molding sand without sea coal or any kind of facing, a casting poured in such a mold will on being cleaned have a surface somewhat resembling a grindstone. This is because the sand became oxidized and fused on to the iron. But supposing the sand from which the mold was made was not in good condition the molten metal in travelling over it will cause it to wash or cut, leaving rough marks on the face of the casting. This in itself might not amount to much as the roughness could be removed but the sand which has been washed out has become oxidized or melted into slag and mixed with the iron. The common idea among molders is that sand which is washed into a mold becomes dried into dust and floats on top of the metal, leaving a very slight thickness of dirt on the surface of the casting, and that the first cut of the machine tool will remove this. But such has not been my experience. It melts into sticky slag, and wherever it touches the mold it lodges, leaving dirty spots which will be exposed when the casting is machined. Of course molds for good work are not made in the rough sand from the sand heap, but supposing the best of facing sand is used and the mold is plumbagoed, even to the gate and pouring basin, it is not likely that the down gate, or sprue as it is sometimes termed, has been faced from bottom to top, and it is not handy to get at with the plumbago brush, so we may depend that it has washed, unless the sand heap is in good condition.

Every spot which is exposed to the melted iron must be faced with good sand or it will make trouble.

I have said that I had no way of overcoming the difficulties arising from bad sand, but I might withdraw that. Thin clay wash can be used safely and will partly renew the strength of the sand. New sand is composed almost entirely of sand and clay in the proportion of about fifteen of sand to one of clay. The sand is the heat resisting element and the clay the bonding material. The heat burns the bond, or adhesive qualities out of the clay, and if this is renewed by the addition of more clay, in the form of clay wash, it will not make it as good as new but it will do quite a bit in that direction. Every sand heap should have some new sand put on it regularly and should also be riddled occasionally to remove scraps of core which get worked through. It is much more profitable for the employer and pleasanter for the molders to have the sand in good shape, as more can be accomplished in a day and a better quality of goods produced.

The Foundry Report An Important Matter

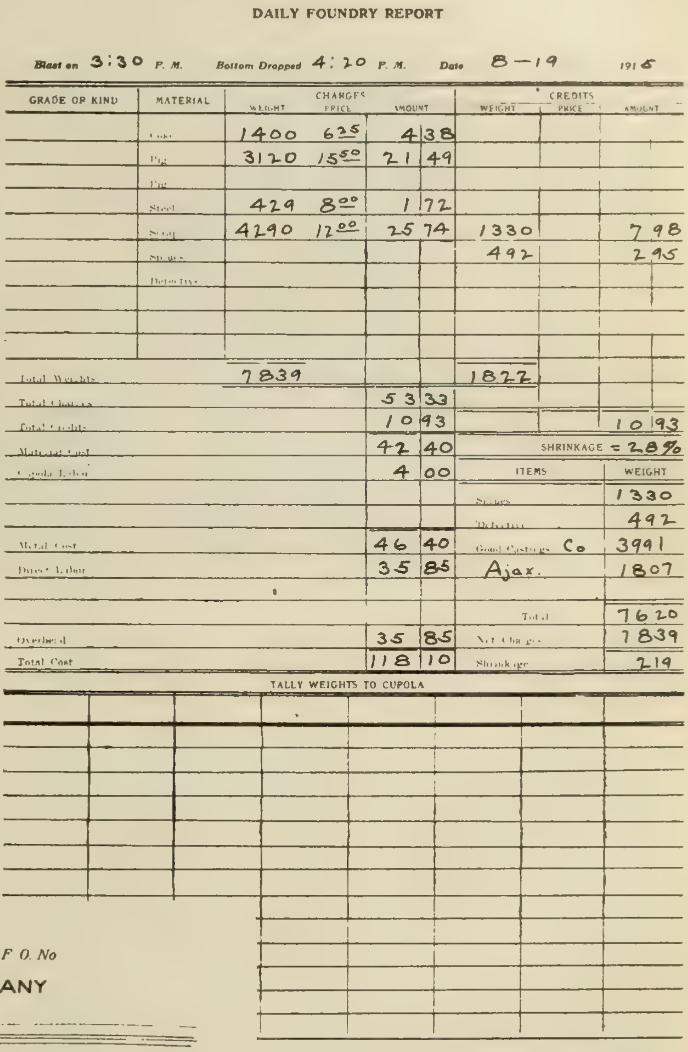
The Cost of Each Heat is Carefully Kept, so That Correct Costs of Castings May be Readily Determined—Work Sent on to Machine Shop at a Fixed Price Checked Each Month

By D. S. MANN, Lima, Ohio

THE particular foundry in which the accompanying forms were used was engaged in the making of gas engine castings, practically no outside work being taken in. Foundry orders were issued in duplicate, one to the foundry foreman and the other being retained by the cost clerk who issued all orders both for the foundry and the machine shop. As the costs were determined by shop order it was advisable to have as few parts on an order as possible. In general, it might be said that an order was issued for each part number and this was true of the larger castings. It was also advisable to make the order large providing it was to be finished immediately, but where the parts were being made in small lots a separate order was issued so that they would not remain too long in the foundry, this being liable to cause confusion with later orders. This also enabled the order to be closed in good time and the resulting cost obtained for comparison with others previously finished.

As the time was reported each day it was transferred from the job cards to the back of the order and when the duplicate was returned from the foundry indicating that the order was completed, this was summarized and the total cost of the order obtained. The back of the duplicate sent to the foundry was ruled for reporting the castings as made, carrying the date, number of pieces, description or part number, weight, price and amount, the two last items being inserted by the cost clerk when the order was returned. From the total direct labor cost and the material the total cost of the order could be obtained. One copy was filed according to order number, thus eliminating the transfer of the cost to a separate sheet for purposes of comparison with other orders for the same part.

The report used to record each heat shows the amount of material, pig iron, coke, steel and scrap used as well as the amount of good castings made, with sprues and defectives. The sample report shows how the cost of the heat was calculated. To the raw material cost was added all the cupola labor so that the "metal costs" represents the cost of the molten metal at the cupola spout. In this particular foundry as the core labor was rather a small percentage and fairly well distributed, all coremaking time was included in the overhead. No attempt was made to get an accurate cost per piece other than for purposes of comparison between the different heats. The castings were delivered to the machine shop at a fixed price per pound representing as nearly as possible the actual cost and this was checked up each month for accuracy, the idea being to show neither profit nor loss. The bottom of the report was used by the cupola tender to record the weights of each charge to the cupola.



DAILY FOUNDRY REPORT

Blast on 3:30 P. M. Bottom Dropped 4:20 P. M. Date 8—19 1918

GRADE OR KIND	MATERIAL	CHARGES WEIGHT	CHARGES PRICE	CHARGES AMOUNT	CREDITS WEIGHT	CREDITS PRICE	CREDITS AMOUNT
	Coke	1400	6 25	4 38			
	Pig	3120	15 50	21 49			
	Pig						
	Steel	429	8 00	1 72			
	Scrap	4290	12 00	25 74	1330		7 98
	Sprues				492		2 95
	Defective						
Total Weights		7839			1822		
Total Charges				53 33			
Total Credits				10 93			10 93
Material Cost				42 40			

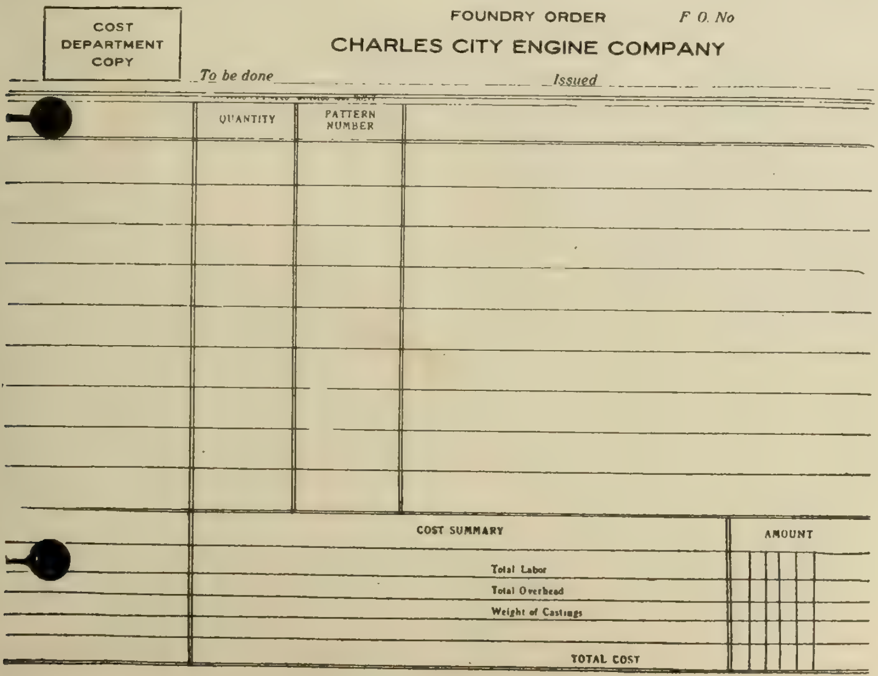
SHRINKAGE = 2.8%

Cupola Labor	4 00
Metal Cost	46 40
Direct Labor	35 85
Overhead	35 85
Total Cost	118 10

ITEMS	WEIGHT
Sprues	1330
Defective	492
Good Castings Co	3991
Ajax.	1807
Total	7620
Net Charges	7839
Shrinkage	219

TALLY WEIGHTS TO CUPOLA

DAILY FOUNDRY REPORT.



COST DEPARTMENT COPY

FOUNDRY ORDER F. O. No

CHARLES CITY ENGINE COMPANY

To be done ______ Issued ______

QUANTITY	PATTERN NUMBER	

COST SUMMARY	AMOUNT
Total Labor	
Total Overhead	
Weight of Castings	
TOTAL COST	

FOUNDRY ORDER SHEET.

The Chemist and Metallurgist in the Foundry

Growth of the Munitions Industry Stimulated Demand For the Technically Trained Man, Particularly so in Chemical and Metallurgical Fields—Every Plant of Sufficient Size Now Recognizes Need For Skilled Supervision of All Plant Processes

By F. E. GARDINER
Chief chemist and Metallurgist for the Dominion Bridge Co., and the Dominion Copper Products Co.

CHEMICAL LABORATORY AT DOM BRIDGE CO.

THE marvelous growth of the munitions industry in Canada during the past three years has ed to an ever-increasing demand for men of technical training along chemical and metallurgical lines. Before the war it was the exception rather than the rule to see men of this training employed, even in the large industrial plants; to-day almost every plant engaged in any form of munition activity employs at least one man thoroughly trained in chemical and metallurgical practice. The duties of the works' chemist and metallurgist are many and varied, depending on the work in which his engaged, as well as the laboratory facilities at his disposal.

Since the spring of 1915, when they first embarked on their munitions activities, the Dominion Bridge Co. and the Dominion Copper Products Co. have manufactured a wide variety of products. All sizes of shells, from the 18 pounder shrapnel to the 9.2 high explosive shell, British, Russian and Belgian cartridge cases, copper driving bands from 3 inch to 9.2 inch, marine engines and boilers, brass and copper tubes and sheets, and miscellaneous smaller components of many kinds, have been some of the munition products which have been manufactured at these plants. Looking at the question from the light of their experience I will endeavor to show in a general way the part the metallurgist plays in the different operations which go to make up the finished product. The same work that is carried on by the metallurgical department in the plants of these two companies, will be carried on to a greater or lesser extent in any of our large munition plants.

The general work of the chemist will lie along the following lines:

1. Chemical analysis of raw materials or finished product.
2. Supervision and regulation over all heat treatment necessary to produce the finished product.
3. Physical testing of all materials, both in course of manufacture and as a finished product.
4. Microscopic examination of the various materials used.
5. Miscellaneous testing and experimental work.

Heat Treatment of 75 m.m. U. S. Shells

The specifications laid down for nearly all shells of a small calibre call for them to be heat treated, after which they must satisfy certain physical requirements. The United States 75 m.m. shell after treatment has to have an elastic limit of 45,000 lbs. per in., an ultimate tensile strength of 90,000 lbs. per sq. in., and an elongation of 15 per cent.

In heat treating steel to achieve any desired result it is a great advantage to know beforehand the chemical composition of the steel. Here is where the chemist comes in. He makes an analysis of the steel and passes it on to the metallurgist who uses this information as his experience directs. In hardening shells of any kind the following are the main factors influencing the success of the operation.

1. Uniform heat to the correct temperature.
2. Good quenching medium, kept at a low temperature.
3. Uniform tempering to the correct temperature.

The failure to observe any of these three factors will often lead to a failure in the steel and cause serious delays in the production of the shop, to say nothing of the additional cost of retreatment.

Uniformity of heating is dependent on several conditions, chief of which are the nature of the furnace used, the kind of fuel, and the efficiency of the labor. As a general thing it may be said that large furnaces of the automatic and mechanical types, using either oil or gas as a fuel, will give better and more uniform results than the smaller furnaces of the also be much smaller and thus lead to batch type. Their radiation losses will increased efficiency and lower fuel costs in operation. However excellent results can be secured from the batch type of furnace also, although these results are—to a much greater degree than in the case of the larger type of furnace — dependent upon the care and supervision exercised over their operation as well as the quality of the labor operating them.

Another factor that greatly influences the uniformity of heating is the use of pyrometers. Any good rugged thermocouple of the base metal type used with a high resistance indicator is suitable, and it will be found that once the men get accustomed to working by pyrometer control, using their judgment as to time and color as a check against the pyrometer readings, very uniform and successful hardening will result.

A good quenching oil should have a high flash point, high thermal conductivity, a low volatility, good specific gravity, and uniform viscosity. A well blended fish and mineral oil possessing a flash point of 400 degrees Fahr. and a specific gravity of about .900, will generally be found to meet these requirements. The reason for keeping the oil at as low a temperature as possible is something that is obvious to everyone. An oil that is continually kept at a high temperature suffers a great decrease in quenching power and is bound to distill off a certain fraction of its lighter and more volatile constituents, leaving the heavier ones behind, which still further lessens its effectiveness.

The correct temperature for hardening and tempering sheel steel depends upon its critical point, which is determined by the percentage of carbon present. In general, the lower in carbon the steel is the higher the temperature it is raised to for hardening, and the lower the temperature it is drawn back to. The range of temperature that we have found to give good results in hardening 75 m.m. shells varies from 1,500 to 1,575 degrees Fahr., according to the carbon content, and the tempering range from 950 to 1,100 degrees Fahr.; the carbon content of steel treated under these conditions has varied all the way from .35 to .55 per cent.

Forging 6 Inch and 9.2 Inch Shells

Another branch of the munitions industry in which great strides have been made is the manufacture of shell forgings. All sizes of shells from the 18 pounder weighing only 25 lbs. in the rough, to the big 9.2 inch shell weighing 375 lbs. have been successfully forged in this country. The Dominion Bridge Company have been forging the 6 inch high explosive shell for the Imperial Munitions Board for the past two years and are now making 9.2 inch forgings for the American government. The billets are heated in underfired furnaces equipped with Ferguson burners and use oil as a fuel, and are subsequently pierced on 700 ton Southwark hydraulic presses. After forging the shells must pass certain physical tests.

The British specifications for forgings of this size call for a yield point of not less than 19 long tons per sq. in., a tensile strength of from 35 to 49 tons, and a minimum elongation of 17 per cent. Needless to say these requirements are not always met with, so that a subsequent treatment of the steel is very often necessary.

The chief cause of failure will usually be found in the overheating of the steel before forging, and it is very hard to make the average heater realize the great effect that any severe overheating has upon the physical properties of the steel. Constant supervision and care over the heating of the billets is the chief essential to successful forging work. Billets which have been slowly and uniformly heated to a temperature of from 1,900 to 2,000 degrees Fahr. will be found to forge just as easily as those whose heating has been hastened and which emerge from the furnace dripping at a temperature anywhere up to 2,300 degrees Fahr. Not only will the correctly heated billet forge just as readily as the overheated one but the results from its physical tests will be immeasurably superior and the steel will have a very much better structure. Knowing the analysis of the steel we can often greatly affect its physical properties by the method of cooling after forging. Cool high carbon steels as slowly as possible, the reverse for low carbon ones.

For purposes of heat treating the forgings which fail to pass the tests may be classified as follows:

Forgings failing in yield or tensile.

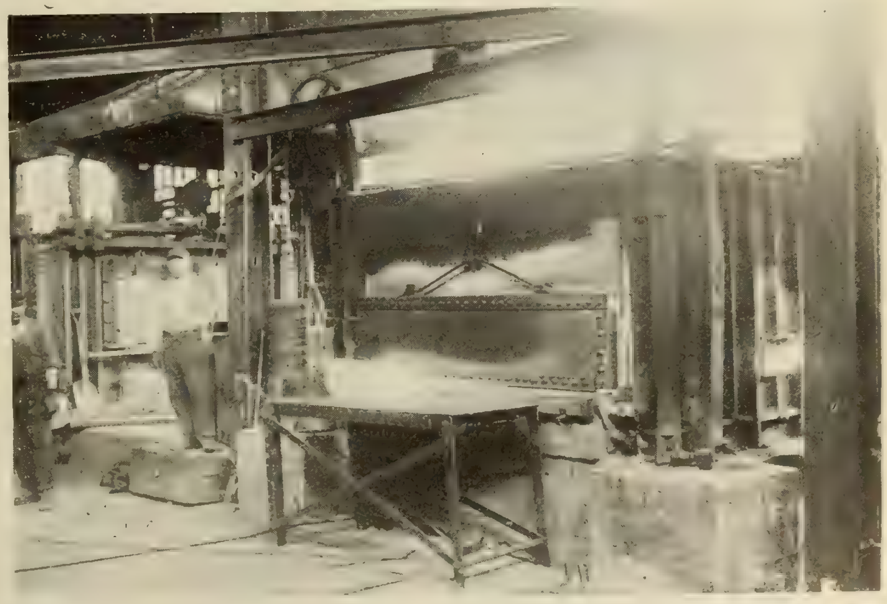
Forgings which fail in elongation.

Forgings which exceed the high tensile limit.

The failures of forgings from the first cause may generally be ascribed to overheating, but it often happens that the steel is so low in carbon that the ordinary methods of cooling after forging are not sufficiently rapid to enable it to pass the physical tests even if it has been forged at the proper temperature. The steel in any forging whose failure has been due to overheating alone can usually be brought into a condition which will enable it to pass the test, by the heat treatment known as "normalizing." This merely consists of heating the forgings slowly and evenly to a temperature, well above their critical range and holding them at this temperature for a length of time which depends upon the severity of their previous treatment, and the results of their first physical tests, removing them from the furnace, standing them on end to cool, as far apart as possible, and allowing a good circulation of air to pass around them. A temperature of 1,550 degrees Fahr. will be found to be good average practice for this operation, which should be carried on as a continuous one, if possible.

Those forgings whose failure is due to a combination of low carbon and overheating will require a quicker cooling than that given by the normalizing treatment. This treatment is known as "air cooling," and as its name implies, it cools the forging by the artificial use of air. The apparatus used for this purpose differs in construction in almost every plant using it, but in the main its general features are the same. The apparatus designed and adopted by the Dominion Bridge Company cools four 6 inch forgings every 9 minutes and consists in essential, of an inner pipe of 3 inches diameter, which enters the shell, and an outer casing of 8 inches diameter into which the shell slides. The outer casing is hinged so that when the shell enters, the hinged section is clamped down and the air blast turned on. The air used is at a pressure of about 8 ounces, and is supplied by a No. 9 Sturtevant blower. The temperature of the shell as it enters the apparatus, varies from 1,550 to 1,600 degrees and its cools in 9 minutes to about 600 degrees Fahr.

The results achieved by the use of this appliance are very good and the tensile strength can often be raised anywhere from 2 to 8 tons, with a corresponding increase in yield. This plant has successfully treated steel by this method, as low as .35 per cent. carbon.



HEATED 9.2 BILLET EMERGING FROM THE FURNACE.

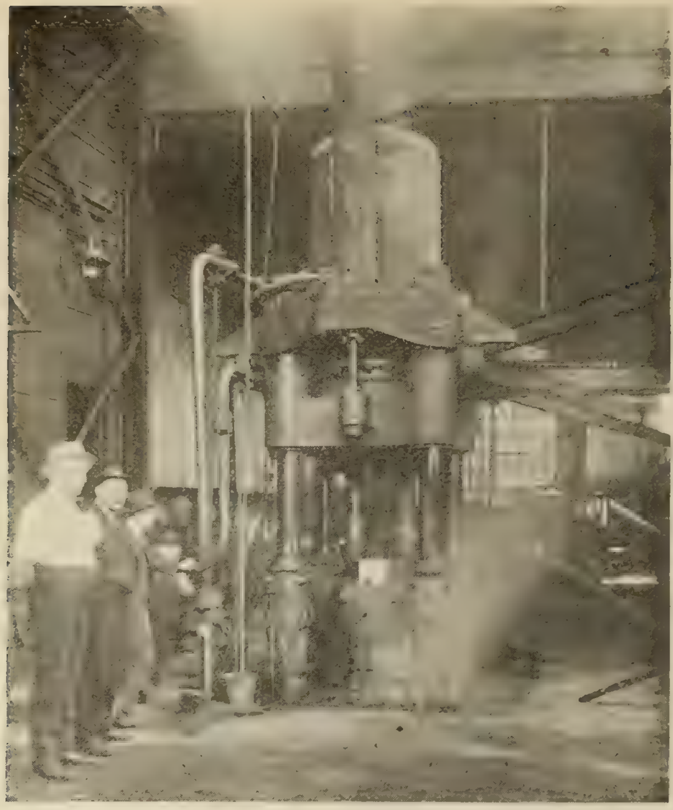
Failure in elongation is usually caused by overheating, but also may be due to forging at too low a temperature. This latter condition, however, is seldom met with in everyday forging practice. Another cause of low elongation is to be found in the nature of the steel itself, flaws often appearing in the fractured test bars. It is almost impossible to do anything with steel whose failure is due to flaws, but where the failure in elongation has been caused by overheating, the steel will usually respond to the normalizing treatment, or if not, to a light anneal.

Failures on account of high tensile can generally be traced to the high percentage of the hardening elements, carbon and manganese in the steel, to overheating or to a combination of both. In order to lower the tensile strength of a steel it is necessary to retard the speed of cooling, or in other words to anneal it. For steel possessing very high physical properties, with a high percentage of carbon and manganese, furnace cooling may be necessary, but as this is a very expensive proposition and also greatly slows up production, it is only resorted to in cases of extreme necessity. Removing the forgings quickly from the furnace after they have reached and been held at the desired temperature long enough, piling them in layers in an iron box or pit, carefully protecting them from all drafts, and covering them with a heavy layer of ashes, will invariably be found to give the desired results. The tensile strength may easily be lowered 5 tons by this method of treatment and production will not be held up as in the case of furnace cooling.

In treating forgings by any of the above processes, it is needless to say that a knowledge of the chemical analysis of the steel treated, as well as the result of its previous physical test, is necessary to achieve the best results. Careful temperature control, which can only be obtained by good pyrometer regulation is also very essential.

Treatment of Marine Engine Forgings

The building of marine engines is another new industry to a large number of plants in this country. Every marine



FORGING 9.2 SHELLS AT THE PLANT OF THE DOMINION BRIDGE CO.

engine has to have a large number of its parts, such as connecting rods, piston rods, crank shafts, etc. made out of forged steel. These forgings all have to be annealed and have to meet very exacting physical requirements. Take for instance Lloyd's specifications for marine engine forgings. These specifications call for a tensile strength of from 28 to 32 tons per sq. in., area of the test piece being ¼ inch, with a minimum elongation of 25 per cent. over 2 inches for steel of 32 tons tensile, and 29 per cent. for steel of 28 tons tensile. In addition to this tensile test a bar cut from the test coupon of section 1 inch by ¾ inch, must stand bending cold through an angle of 180 degrees.

A steel that will conform to these rigid requirements is not always easily attained owing to the enormous and ever increasing demands upon the steel mills. Such being the case, it is the duty of the metallurgist to use whatever steel he can obtain, if it has any chance at all of passing specifications, and endeavor to put this steel in such a condition after forging, by an intelligent application of the rules of steel heat treatment, that it will conform to the required physical requirements. Generally speaking, when a steel of any given carbon content possesses its lowet tenile properties, it also possesses its maximum, or very nearly its maximum, ductility. Thus, if we are using a steel whose carbon content is on the high side, this steel must be annealed very carefully, and slowly cooled, in order to meet the physical requirements as given above.

Slow cooling, especially through the critical range of the steel, enables the maximum amount of ferrite, or pure iron crystals to separate out from the iron-carbon alloys, and this gives us the results we are after; that is, low tensile strength and high ductility. Sometimes even this treatment will not enable the steel to successfully pass the bend test, in which case a double annealing may be resorted to. This consists in heating the steel well above its critical range, say to 1,500 degrees Fahr., slowly cooling in the furnace to 1,200 degrees, reheating to just under the above critical point, which depends upon the carbon content of the steel, but is generally in the neighborhood of 1,350 degrees, and then allowing the steel to cool in the furnace. This treatment will invariably raise the tensile a little, but gives the steel great ductility and cold bending properties. The steel also shows a large reduction of area and breaks with a well cupped silky fracture.

Steel low in carbon should not be given such a thorough anneal and should be allowed to cool in the air whenever possible. Our own experience has been that any steel ranging from .25 to .35 carbon. and from .40 to .80 manganese, will meet these requirements if intelligently handled. A steel that will always give good satisfaction for marine engine work would be one of .30 carbon and .50 manganese. If a steel of this composition is carefully annealed at from 1,450 to 1,500 degrees its physical properties will always be found to come within the limits laid down above.

The method of handling any forging work of this character in use at the plant of the Dominion Bridge Company is as follows: Every billet which comes into the shop is numbered consecutively, drillings taken and a chemical analysis made. When forgings are made from this particular billet, the original billet number is stamped on each forging and also on the test coupon, which is left on the end of one of the forgings made from every billet. In this way one test covers all forgings made from the same billet and all duplications of testing is thus avoided. The forgings are grouped together in the annealing charge, according to the chemical composition of the billet from which they were made, and all forgings of approximately the same chemical composition are annealed together and receive identical treatment.

Cast House Practice of the Dominion Copper Products Co.

Passing now from the ferrous branch of metallurgical operations as exemplified by the products of the Dominion Bridge Co., we come to the non-ferrous field in the Dominion Copper Products Co. From a metallurgical standpoint one of the chief differences between steel and the non-ferrous metals and alloys such as copper and brass, is the fact that we can bring steel from a dead soft to a glass hard condition by simply heating it above its critical point and quenching it in water. Such is not the case with copper or brass. In order to harden either of these metals it is necessary to change their structure by the application of some mechanical strain, and the

FURNACE USED FOR HEAT TREATMENT OF FORGINGS SHOWING AIR COOLING APPARATUS IN PLACE.

CASTING BRASS TUBES IN CAST-HOUSE OF DOMINION COPPER PRODUCTS CO.

greater this strain is the harder the metal becomes, with a consequent decrease in ductility.

In any copper or brass rolling mill the first place where any chemical or metallurgical work occurs, is in the cast house, where the different alloys are made. The raw materials that enter into the composition of the different alloys are first carefully sampled and analysed to insure that no foreign elements are added to the alloys by impurities existing in the virgin metals. Copper, zinc, tin and lead, are the chief metals used in rolling mill alloys. After the virgin metals have satisfied the chemical requirements, the charge for any given alloy is weighed out into pans and conveyed to the cast house to be melted and cast into different kinds of moulds. The furnaces used for melting at the plant of the Dominion Copper Products Co. are of the pit fired type, the fire chambers being 15 by 15 inches in cross sectional area, with a grate at the bottom on which the fuel and the crucibles rest. The fuel used is anthracite coal and the draft for combustion is supplied by stacks 86 feet high and 2 feet 8 inches in diameter, each stack supplying 20 fires.

The charge is melted in graphite crucibles of different sizes, holding from 160 to 220 lbs. In making ordinary cartridge brass the procedure is as follows: The scrap is placed in the bottom of the crucible and the copper ingots are laid on its rim to heat up. After the scrap has melted, about a handful of coarse salt is added, then the copper, and the charge is completely covered with charcoal. When the copper has melted the spelter is added little by little about 10 or 15 minutes before pouring. The average time for a charge of 200 lbs., including charging, melting and casting, is about two hours. The molten charge is then poured into moulds and allowed to cool.

The chief alloys made are Muntz metal, an alloy of 60 per cent. copper and 40 per cent. zinc, used chiefly for condenser heads and tubes made by the hot piercing process; Admiralty metal, 70 per cent. copper, 29 per cent zinc, and 1 per cent. tin, used for condenser tubes on account of its great resistance to corrosion; cartridge brass, 70 per cent. copper and 30 per cent. zinc; 2 and 1 brass, as its name implies, an alloy containing 2 parts of copper and 1 of zinc; and several kinds of bronzes which generally contain varying amounts of tin in addition to the copper and zinc.

In order to insure uniformity of product it is necessary that frequent samples of the various mixtures cast be taken daily. This is done by the foreman caster, who marks the number of the mixture on the sample button, and it is then sent to the laboratory and analyzed. Any variation from the desired analysis is rectified by changing the mixture, in this way the different alloys are cast to a composition very closely approximating that desired.

One of the main objections towards the melting of copper and zinc alloys in fuel fired furnaces is the unsanitary conditions existing in the cast house, especially in the summer months, and the consequent inability of the plant to keep experienced help. Other objections are to be found in the high cost of fuel, crucibles and labor, and the high metal losses, generally due to the volatilization of the zinc. All these facts contribute to a feeling among brass men that a solution of these difficulties will be found in the electric furnace. Numerous electric furnaces have been tried out in the various mills of the United States during the past two years. The experience derived from these different experimental furnaces has seemed to show that an electric furnace of the induction type is best suited for the melting of these brasses high in zinc. This type of furnace is capable of very accurate heat control, has a high thermal efficiency, and keeps the metallic losses down to a very low point. The Dominion Copper Products Co. is at present installing an induction furnace of the Foley type, having a melting capacity of 1,000 lbs. per hour. The electric furnace as applied to brass melting is only in its infancy, but if it meets with anything like the same success that it has in the steel industry it will eventually find a very wide application in the non-ferrous field.

Copper Refining Furnaces

In any rolling mill handling copper there is always large scrap accumulations which it is not economical to return to the cast house for remelting. Such products are usually in the form of light turnings, metal recovered from cast house ashes, mill sweepings, black copper from the cupola and miscellaneous copper scrap of all kinds. To handle this metal, as well as other metal they receive from outside sources, the Dominion Copper Products Co. have two copper refining furnaces of 15 and 25 tons capacity per 24 hours. These furnaces are of the ordinary reverberatory type, fired by

CASTING COPPER SLABS.

soft coal. They are set up on cast iron plates resting on brick piers, and the bottom and the inside of the furnace which come in contact with the molten copper, are made of silica brick. The draft is supplied to each furnace by meaus of a brick-lined flue of two feet interior diameter, which leads into a 60-foot firebrick-lined stack, of three feet interior diameter.

BACK VIEW OF THE 15-TON FURNACE SHOWING CHARGING FLOOR.

A charge is tapped from each furnace every 24 hours and the refined copper is either cast into ingots for use in the cast house, bowl cakes to be drawn out into tubes or bands, or cake copper to be rolled out into sheets. The moulds are placed on a circular rack revolving about a central post by which it is supported. The molten copper is tapped from the furnace into a clay-lined tilting spout, and from there into the moulds.

A typical analysis of the copper which comes from these furnaces would be. copper 99.87 per cent., oxygen 0.08 per cent., other impurities 0.05 per cent. This percentage of oxygen which exists in copper in the form of cuprous oxide, is necessary, as it enables the copper to be cast free from blowholes and also checks the ill-effects of any other impurities which may be present in the copper. Copper containing this amount of oxygen is in its "tough pitch" condition, and it is in this state that it exhibits its best physical properties. When fractured it should show a rose pink color and have a silky structure.

During the process of refining copper considerable slag is made, the amount and composition of this slag depending to a great extent on the nature of the charge to be refined. The following is a typical analysis of a refined slag: Copper, 40.0 per cent.; silica, 29.5 per cent.; iron, 9.4 per cent.; lime, 2.5 per cent.

As will be seen from the analysis this material is very high in copper and consequently of considerable value.

Black Copper From the Cupola

The next step in the scheme of metallurgical operations is therefore to recover this copper from the slag. This is done by smelting the slag in a cupola using coke as a fuel and roasted pyrites and limestone as a flux. Besides the refining copper and fluxes, the charge usually consists of mill sweepings, fine material recovered from the cast house ashes, ashes from the cupola flue, and old bricks from the worn out refining furnace linings which are generally impregnated with copper to a considerable extent. These various materials are weighed and charged into the cupola in regular sequence, as many as 75 charges being melted down in 24 hours, and from 5 to 7 tons of black copper averaging 95 per cent copper recovered per day. This material goes back to the refining furnace and completes the cycle of operations.

Daily analyses are made of the slag from the cupola. This is necessary in order to keep it of the proper composition to get the requisite degree of fluidity, and the right fluxing action to insure a good copper recovery. The fluxes that are used are also sampled and analysed as any considerable amount of impurities present in them would have deleterious effects upon the melting operations. For instance, the occurrence of much alumina in the limestone with the presence of much sulphur in the pyrite under would form a quantity of copper matte which would lead to considerable trouble in the subsequent refining.

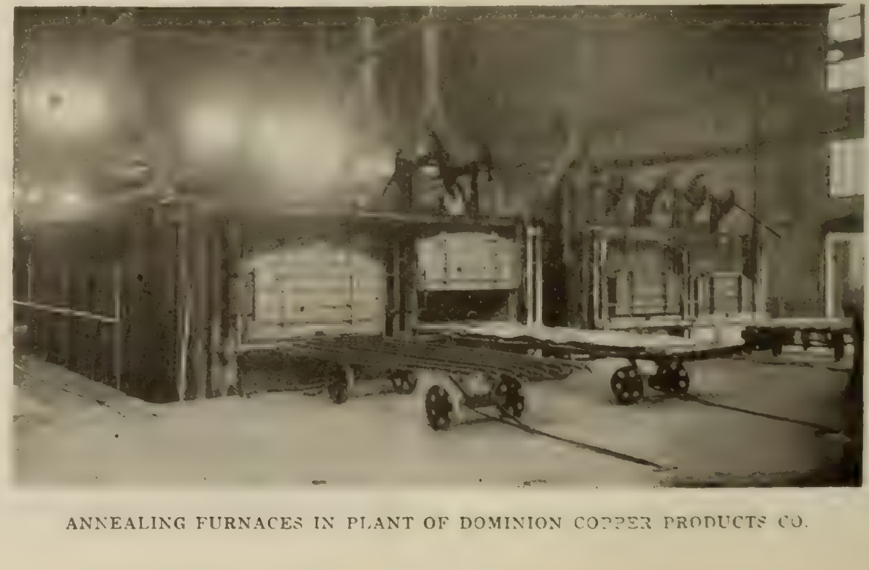
Annealing of Brass and Copper

Another part of the metallurgist's work in a brass rolling mill deals with the annealing of the material in the process of manufacture. After a certain amount of work has been accomplished on either brass or copper it is necessary to anneal it before more work can be performed. Annealing changes the highly distorted and elongated structure of rolled brass to a uniform crystalline structure and the metal becomes soft and ductile. The temperature and time of annealing depends upon the previous work performed on the brass and also upon the degree of softness required. To anneal brass or copper to a dead soft condition a uniform heat of from 1,200 to 1,250 degrees Fahr. will usually be found to be sufficient. The same applies to the heat treatment of brass as to that for steel, namely, that good temperature control cannot be effected without the use of accurate pyrometers.

The annealing furnaces in use at the plant of the Dominion Copper Products Co. are of the underfired type, using oil as a fuel. The material to be annealed is loaded upon sheet iron pans, drawn into the furnace by long hooks, passes through the furnace and out at the opposite end where it is either sprinkled with water or left to cool by standing in the air.

Microscopic Examination of the Metals

The foregoing resume of the everyday work of the plant chemist and metallurgist has dealt with his work mainly from a strictly chemical and metallurgical standpoint. Another branch of work which comes within the field of the met-


ANNEALING FURNACES IN PLANT OF DOMINION COPPER PRODUCTS CO.

TAPPING BLACK COPPER FROM THE CUPOLA, DOMINION COPPER PRODUCTS CO.

allurgist and in which great strides have been made during the past few years, is the science of metallography or the microscopic examination of metals. By means of this science the metallurgist is able to ascertain if the treatment he has given any metal in process of manufacture has achieved the desired results and imparted to the metal that structure which it must have if it is to meet the requisite physical tests. A microscopic examination of a piece of metal, steel or brass, will often give the metallurgist information which it might take days to find out by other means. Not only will it justify or condemn the accuracy of his treatment but it will often locate for him causes of failure or deterioration in metals which could never be detected by ordinary chemical or physical examination.

A case in point came up at the plant of the Dominion Bridge Co. a short time ago. Several furnace plates which were used in the construction of marine engine boilers, when heated and flanged, showed serious cracks and flaws in the steel. At first sight these defects looked as if they might be due to overheating or to red shortness in the steel due to a high sulphur content. A chemical analysis showed the sulphur to be low and a physical test cut from the portion of the steel adjacent to the cracks gave results well within the limits for a steel of that quality. A specimen that contained several cracks was then polished, etched and examined under the microscope. The structure of the steel was good and no signs of overheating were in evidence. Finally about 1-32 was filed off the face of the specimen and it was repolished. An examination then disclosed the cause of the failure. Embedded in the steel were particles of slag and all around the edges of the cracks broken up particles of slag could be seen, showing that these cracks had all taken place where the larger slag particles had originally existed in the steel. This is only one instance of the use of the microscope for the examination of metals.

Physical Testing and Miscellaneous Work

In the larger munition plants the metallurgist generally also performs the duties of a testing engineer. He carries out all the tensile, compression, bend and any other tests called for in the specifications for the finished product. A well equipped testing laboratory where physical tests can be made at a moment's notice will often save the manufacturer considerable money, especially at the beginning of a new industry when things are generally more or less in the experimental stage.

Other tests which the works chemist may be called upon to make include the testing of a coal or oil for calorific power or for some impurities such as sulphur, which might be detrimental to a certain melting or heating operation if present in excess. The testing and analysis of refractory materials of all kinds such as fire brick, clays, sands, and graphite also come within the scope of his work. The examination of quenching oils, cutting compounds, greases, scraps, and in fact any of the innumerable materials of this nature which enter into the various shop processes may also be a part of the chemist's daily work.

From this outline of the work of the chemist and the metallurgist in one of our large industrial plants engaged in the production of munitions it will be seen that he enters directly or indirectly into some stage or other of almost any of the finished products of the shop.

To sum up, the chemist and the metallurgist have played a prominent part in the development of the munitions industry in Canada and all signs point to the probability that in the future, when the industrial expansion will lie along more peaceful lines, the chemist will be able to still further widen the scope of his many activities.

PHYSICAL TESTING LABORATORY, DOMINION BRIDGE CO.

Industrial Enterprise and Our Natural Resources

CANADA is a land rich in natural resources, her mines, timber, and the possibilities inherent in her many waterpowers being well known. With these advantages it is not surprising that engineering and manufacturing industries closely allied therewith should reach a high state of development, and the fact that Canada supplied fifteen per cent. of the shells used by Great Britain last year points in some measure to the importance of these factors of her national life.

One of the greatest fields for engineering work for some time past and one upon which the present munitions activity is largely based is that of hydro-electric development, and in this as in the development of other natural resources the Canadian Allis-Chalmers Co. have player an important part. Through its affiliation with the Canadian General Electric Co. this firm is enabled to supply complete equipments for power plants of every nature. The principal factory of the lattery company at Peterborough occupies a site of about 35 acres and is devoted chiefly to the manufacture of generators, motors, transformers, switchboards and other electrical proucts.

The principal plant of the Canadian Allis-Chalmers known as the Davenport works, Toronto, covers over 40 acres and includes machine shops, pattern shops, grey iron foundry, pipe foundry, boiler, plate and forge shops. Here much of the heavier engineering work developed; locomotives, steam shovels, structural steel railway and highway bridges being among the products.

One of the accompanying illustrations shows the interior of the foundry. Here the major portion of the large and intricate moulding and casting is done.

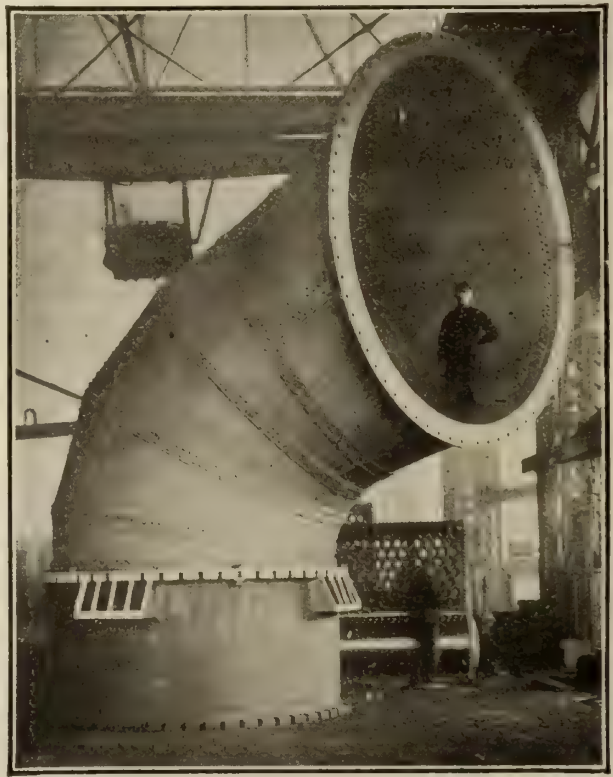


PLATE WORK—ELBOW FOR PENSTOCK FOR NIAGARA FALLS POWER PLANT.

Another view shows an interesting piece

factory of the latter company at Peterborough occupies a site of about 35 acres and is devoted chiefly to the manufacture of generators, motors, transformers, switchboards and other electrical products.

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concrete spiral casing, the turbine when of core work in connection with the building of a vertical water turbine set in a installed developing 6,000 h.p. at 164 revs. per min. and under a head of 70 ft. The cores shown are for the runner and the method of building up the complete mold by the assembling of the numerous cores is clearly shown.

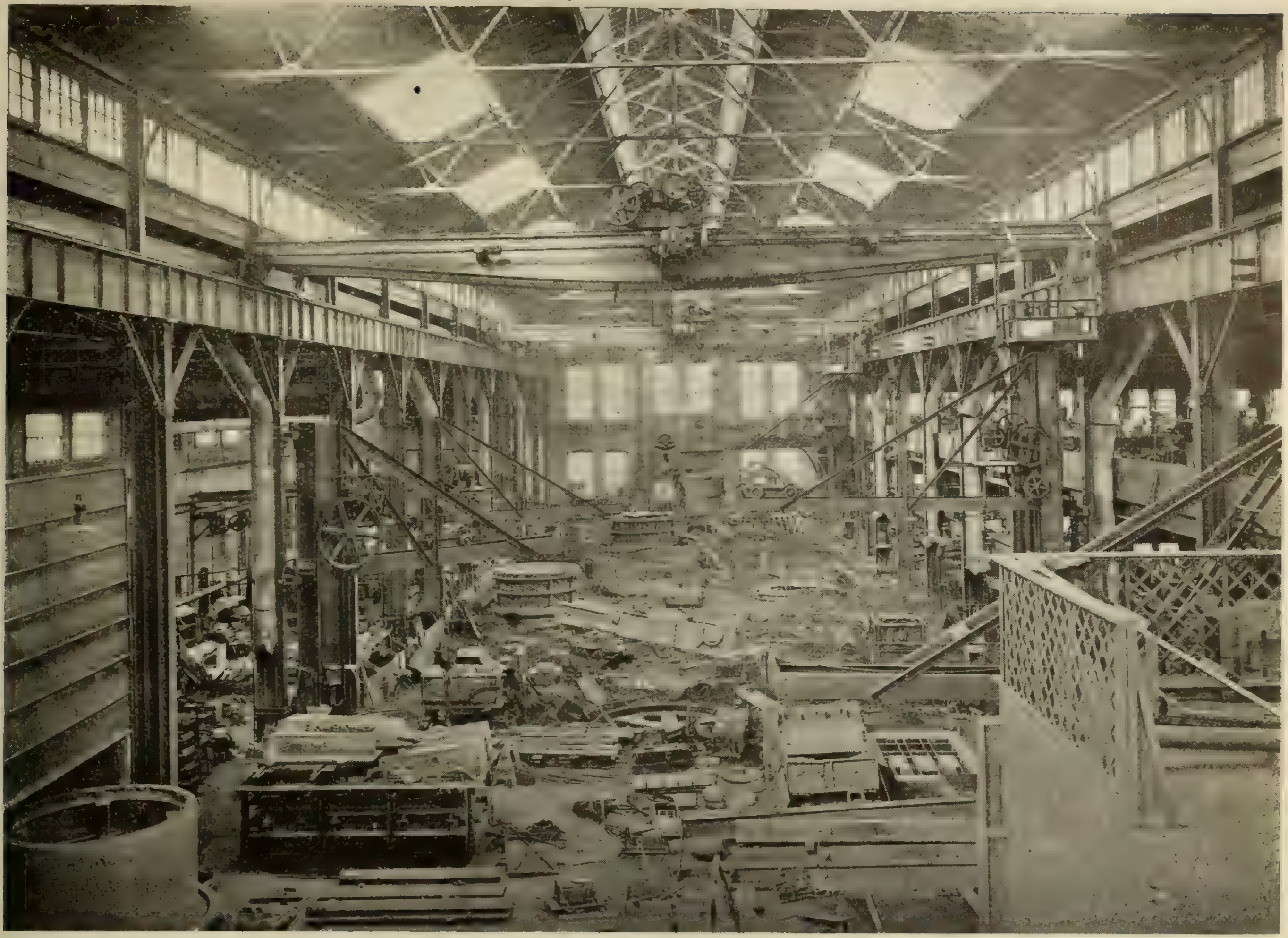
The plate shop makes a specialty of heavy and difficult work and the illustration showing a penstock elbow gives some idea of the work encountered in moulding the large penstocks necessary for the power plant at Niagara Falls. The penstock elbow illustrated is 10 ft. 6 ins. diameter at the bottom and terminates in an ellipse at the top 12 ft. 10⅝ ins. high and 11 ft. 8½ ins. wide.

The Rockfield Works at Lachine, Que., cover about 17 acres and are provided with foundry, pattern, machine and forge shop equipment suitable for general engineering work. There is in addition a testing laboratory for centrifugal pumps, one of the most complete of its kind on the continent. The products of this plant include hydraulic turbines and governers, centrifugal pumps, hoisting engines, logging machinery, etc.

The Stratford Works, covering 7 acres, are specially equipped for the manufacture of a complete line of flour mill, grain elevator power transmission machinery, while the works at Bridgburg, covering 124 acres, are devoted to bridge and structural steel work.

Ornamental Bronze and Iron

The development of the use of ornamental iron and bronze in the buildings of Canada in recent years has kept pace with the great improvement in the architectural features of the cities of the country. In no other way has the ad-



VIEW IN FOUNDRY OF THE ALLIS-CHALMER'S DAVENPORT WORKS, TORONTO .

vancement of the country been so remarkably demonstrated as in the architectural works which have been erected in every city from coast to coast. The development in culture and arts has gone hand in hand with the expansion so noticeable in industry and trade.

In the earlier years there were so few of the better class buildings erected that it was necessary to import many of the ornamental features, no inducement being offered for native manufacture. The architectural bronze and iron works of the Canadian Allis-Chalmers is carried on as a distinctly separate business so that architects and contractors are anabled to maintain a close connection with their own special productions and avoid the possibility of confusion with other branches of the parent company.

New workshops were recently erected and the entire unit is self contained. From the office and estimating staff to the draughting room the pattern shops and modelling room, the iron foundry, the bronze foundry, the fitting shops for iron and bronze, the plating plant, the blacksmith and grilla shops every department is as complete as possible.

One of the illustrations shows a part of the iron foundry where all the cast iron ornamental work is executed. This work, while never very heavy, requires a high degree of skill for its execution and extremely good and careful moulding.

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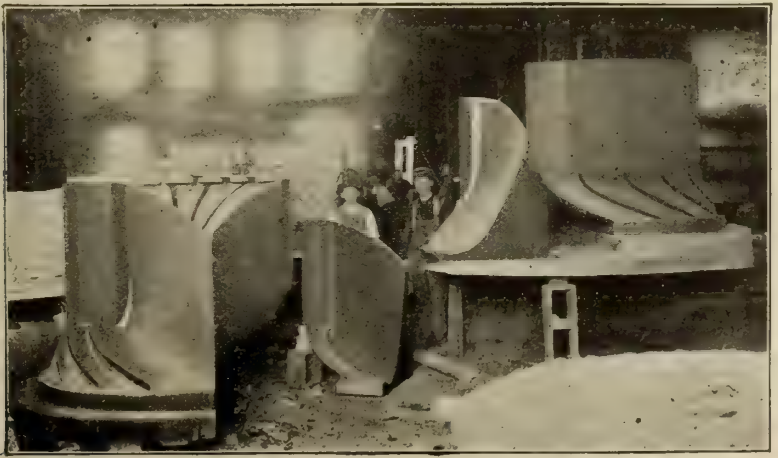

MAKING THE MOULD FOR THE RUNNER OF A 6,000 H.P. WATER TURBINE.

RECLAIMING FOUNDRY REFUSE

In a letter to the CANADIAN FOUNDRYMAN, Mr. R. A. Manigold, of the Dings Magnetic Separator Co., has some interesting things to say on the above subject.

In these days when conservation is occupying the minds of our manufacturers, Mr. Manigold's statement that from 10 to 20 per cent. of the contents of the foundry dump consists of good iron, which can be readily recovered by the use of the magnetic separator, challenges attention. He states that the iron so recovered is of good quality and this has been proved by first melting it into pig, from which borings were taken and analyzed, and found O.K. The pig was then melted and poured into small castings, which were afterwards machined all over and found to be good in all respects. He also instances recovery of nails in steel foundries, citing a case

IRON FOUNDRY OF THE ORNAMENTAL BRONZE AND IRON WORKS

where the stock of reclaimed nails was sufficient to keep the supply going for several months.

He points out that in some cases independent companies have found it possible to make a profitable venture in reworking old foundry dumps, benefitting by the carelessness of the dumpers, who could have utilized the lost metal profitably by the separating process.

◆

Either hysteresis or its mechanical analogue, backlash, is present with startling regularity in every measuring instrument, according to Mr. F. J. Schlink in "Engineering News Record." Even in an automatic scale, where the parts may all be subject to low working stresses, and may be constructed with the utmost care and nicety of fit, the scale readings exhibit the characteristic divergence between the increasing load and decreasing load branches of the correction curve, strikingly similar to the hysteresis loop met with in the stress examination of a material. If the scale is not of the elastic resister type, of which the spring scale is an example, the hysteresis loop must rise almost exclusively from non-reverting shifts and the like in the linkages. That this is the case is clearly shown in such a scale by the settling back to the initial condition which occurs when the parts of the scale are sharply jarred under load.

◆

NEWFOUNDLAND'S TRADE AND IMPORTS

Trade Commissioner W. B. Nicholson, writing from St. John's, Nfld., on August 29, says:—"Owing to the customs returns of Newfoundland being prepared more with a view to showing the source from which the revenue is derived than to furnishing information in detail regarding the import trade of the country, various articles subject to the same rate of duty are frequently classified under one head, rendering it impossible to furnish inquirer with information regarding the value of imports of commodities not specified in the annual reports.

For the information of Canadian manufacturers of machinery seeking markets abroad, the following figures compiled from the customs returns for the fiscal years ended June 30,1916 and 1917,,should be of interest, as they show the requirements of this market, the value of imports in the machinery line and the duty thereon:—

Machines and Machinery, Radiators, Electric Light Material, etc.—	1916	1917	Duty
United Kingdom	$ 691	$ 1,312	35%
Canada	10,377	19,737	
United States	36,235	89,471	
Machines and Machinery, Typewriters, Sewing and Knitting Machines—			
United Kingdom	36,345	64,731	25%
Canada	24,916	46,619	
United States	118.324	141,074	
Holland	97	......	
Sweden	419	156	
St. Pierre	132	118	
Denmark	......	58	
Motor Engines—			
Canada	3,051	19,716	25%
United States	33,8[illegible]	[illegible]	
Sweden	......	1,265	
Motor Engines for Fishery—			
Canada	47,162	51,749	10%
United States	86,544	93,767	
Sweden	732	2,321	
St. Pierre	395	1,062	
Agricultural Implements—			
United Kingdom	2.046	1,144	10%
Canada	5,706	6,965	
United States	4,970	3,682	
Sweden	258	......	
Material and Machinery for Pulp Mills—			
United Kingdom	628	......	Free
Canada	7,131	......	
United States	16,112	......	
Machinery for Mining Purposes—			
United Kingdom	......	54,674	10%
Canada	......	265,258	
United States	......	68,836	

I GUESS WE'LL BE GOING, TOO

FROM where we're sittin' it looks as though there was going to be one big time in Millwalkey on October 7. Of course, that means that they'll go through the first canter on that day and meet each other and say hello, how are you, and how was Dan's folks when you left hoam, and such things, and then the convenshun is liable to spin out for the best part of a week and we reckon that they should be havin' a big time for they're ain't no pikers in foundrymen when they start to taik the heirdles, for there's lots of sand in them and by lookin' over the exhibitors what's goin' to be there it seems that a lot of them is showin' flasks and we suppose that not a few from this side of the line will say, hello Dan I'm interested in your show of flasks because we haven't had a very good showin' in Canada since they put the sand blast on J. Barleycorn on September 16, some two years gone past, and we reckon there will be a searchin' investigation on the inside workin' of them flasks and they must be gettin' ready to give folks a good time, too, for we see as how some stands is showin' hand squeezers and how they work and they're also observin' the general hard times and food regulations, because right in their notices they call attenshun to strippin' plate and we was taking it for granted that they wanted folks to have a good time and eat all that was sot before 'em and they must be goin' to give folks a ride in the street cars, because one chap says as how he's got modern jolt machines at the gatherin' and we know that's just a peculiar way of sayin' that it's a street car and they're goin' to be putting on a rush hour street car performance at another exhibit because it says they've got a combined jolter and squeezer, and that describes a 5.30 street car rite from the back steps through to the dashboard and then they're makin' preparations to have the folks all cleaned up for their meals because they've got a sheet metal shower bath and we reckon that it will make folks homesick for the good olde days when they used to go to sleep listenin' to the rain hammerin' on a tin roof, and there's goin' to be somethin' for them what like to do a bit of farmin' on the side, as one man wants folks to come and see his exhibit of rams and in case anybody gets mixed up with one of them rams and gets the worst of it and has his good clothes all tore up, they've got slip jackets at quite a lot of plaices so there ain't no chance of a person wanderin' about in a fig leaf thingamagig, and refreshments is goin' to be served for they have notices out that they've got quenching oils and parting compounds and we have it figured out that that means something pretty good, because one day we ate in a hotel and had consomme de la oxe tails and when the waiter waltzed in and spun the dish in front of us and after we had a good drink of the de la consomme oxe we found it was plain every day soup like we get to home the fourth day after a roast of beef has come to dwell among us, and anyhow it looks like as though there was all sorts of jimcracks goin' on over at Milwaukey so there's nothin' left but to fall for it, so let's go, eh Dan?

Malleable Iron vs. Wrought Iron Castings

There is Always More or Less Delay in the Matter of Securing Delivery of Castings From Annealing Ovens—The Making of Wrought Iron Castings Provides a Way Over the Difficulty

By MARK MEREDITH

MOST firms using malleable castings purchase them from foundries specializing in this particular form of casting, the annealing being usually the part of the work which causes trouble, as the moulding and casting can be done anywhere by skilled foundrymen. If the annealing ovens take a charge of, say, 2 tons of particular type of casting taking three or four days to anneal, and you give an order for 2 tons, the probability is that you get delivery within perhaps twelve or fourteen days; but if you only order 2 cwt. of that particular type, and no one else orders sufficient of a type that anneals with yours, you may have to wait for eight or ten weeks before you get delivery. It does not pay to run an oven on 2 cwt. of castings, and it is awkward to arrange the flasks in a 2-ton oven for another, to say nothing of the waste of fuel and labor which would be made, and therefore it is a pretty general rule to wait until a full charge can be made up.

Use Larger Quantities

Of course, from a practical point of view, each annealing charge has to remain in the oven until the articles requiring the longer time are finished, and this would possibly again cause confusion and loss, because after the metal has been changed into its new form it does not improve by much longer heating. At the same time, if users of malleable castings were to arrange to take sufficiently large lots of each type they use so that the ovens could be regularly and fully charged, no cause of complaint need arise, and it is up to users to make their arrangements agree with the requirements of the makers, either taking the necessary weight at each consignment or co-operating with others to the same end.

In any case, the question is not one of cost of production but one of time, and time being an essential in the delivery of goods, it is a prime necessity that all parts for assembling shall be in hand in good time, delay in one item alone often preventing delivery of the finished articles for a much longer time than the delay caused by the non-delivery of the part to, say, the turnery or fitting shop.

The Wrought Iron

As against the delays caused by the use of malleable cast iron parts, the use of castings made from wrought iron which can be used as soon as cold from the mould presents many points of advantage, especially as they can be made in any crucible foundry under fairly easy conditions melting, perhaps, giving the most trouble at first. Wrought iron free from carbon, melted in clay or other carbon free crucibles at a heat varying from 1,500 deg. Cent. to 1,600 deg. Cent., and treated with a small percentage of ferro-aluminium or other dioxidant, will on an inch bar bend back quite 120 deg. if not more, and as there is great ductile strength—practically equal to that of the puddled bar—such castings quite fulfill all purposes that the annealed castings are generally used for. There is no advantage in cost as a general thing, but the time element is done away with, and where one runs his own foundry on the works the production of wrought iron castings is only limited by the time occupied in preparing patterns and moulds, as the metal can be melted, as a rule, in two or three hours.

A Particular Work

The metal being very hot when poured, a good sand is wanted for the moulds, the same as in steel moulding, while there should be no plumbago facings used, and for this reason a moulder used to making mild steel castings should, if such is possible, be employed. The melting must be done in furnaces having a strong natural draught or a forced draught, as may be found necessary, the actual melting of a 75-lb. barrel-shaped crucible of iron only taking on an average just over two hours if the furnace is right for the purpose, although it may be reckoned that four melts in 10 hours would leave nothing to cause complaint if not more than 2 lb. of coke per 11 lb. of metal melted was used. The absence of carbon being first of importance, the iron must be carefully selected, Swedish bar usually giving the best results, but some of the best brands of boiler plate run this closely, and for many purposes answer well.

The crucibles must be closed until the metal is melted, because at some temperatures the metal absorbs carbon in a gaseous form; but the luting used should be a soft one, as in the final treatment the covers have to be removed before the crucibles are lifted from the fire. In the aluminium process, up to 0.25 per cent. All is introduced in the form of carbon-free high-grade ferro-aluminium of roughly, 15 per cent. All lcontent the exact amount being dependent on the class of iron used and the percentage of aluminium in the alloy. This "physic" as it is termed, is broken small and heated to near redness before it is placed in the molten metal, into which it is vigorously stirred, and as soon as reaction ceases the crucible is lifted, and carefully skimmed and then at once poured, the metal teeming quite fluidly and filling the moulds without ebullition, provided there is no excess of moisture in the sand.

Can Be Annealed

If extra softness and ductility is desired, these wrought iron castings can be annealed in the same way as mild steel, a matter of 24 hours usually being long enough for this operation if a temperature of approximately 800 deg. Cent., can be kept up regularly; but this is a matter of detail which has to be arranged to meet requirements.

To some extent wrought iron castings are made and used in this country, but they are more used in America, it not being necessary to confine the manufacture of aluminium process, as any metallurgical chemist can readily determine. It is necessary, however, to eliminate carbon as much as possible, for which reason the making of the castings may very well be classed as a form of steel making.

The cost of both malleable and wrought iron castings is approximately the same when all charges are considered, but the time advantage—which is often the most important consideration—is entirely on the side of the wrought iron castings, and makes their production a matter of some considerable importance in many places.

For some purposes the annealed malleable castings cannot be displaced at present, whatever may happen in the future; but unless made in quantities they must in many cases give way to the wrought iron castings as these, if carefully made, fulfill all the conditions needed in a malleable casting as it is a rare thing to require this class of casting to bend to 90 deg., forming a right angle to the main body. More usually resistance to fracture from shock or chance blows is as important as the actual bending of parts of iron constructions, and given a sufficient tensile strength in addition, little more is needed if the castings can be also produced quickly in small numbers when required.

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The presence of acid in oil or grease is very deleterious to the bearings, especially ball bearings, as it causes more or less rapid corrosion. To test oil for acid, clean a piece of sheet copper, cover it with the oil and let it remain for several days. Should a green deposit form on the copper it may be concluded that acid is present. Lubricating oil or grease should be absolutely neutral in its character.

Great Importance Of Buying Good Pig Iron

If it is Too High in Sulphur or Too Low in Phosphorus Trouble Will Follow Its Use—Fine Grades For Strong Castings Require a Careful Analysis

By E. STANDIFORD

WHEN you require a good clear pig iron, free as possible from dross, kish, oxide, sand, etc., the following analysis will be found an excellent grade. The percentage of "sows" must never vary to any great extent from the usual amount found in a strictly graded iron, according to the old fracture method.

Analysis of Foundry Pig Iron, No. 1

	Per Cent.
Silicon must not be less than	2.50
Sulphur must not exceed	0.03
Phosphorus should not exceed	0.60
Manganese should not exceed	0.50
Total carbon not specified.	

The carbons will usually be between 3 and 4.50 per cent. in this grade. Any No. 1 foundry pig which shows on analysis less than 2.40 per cent. of silicon or more than 0.035 per cent. of sulphur should be rejected.

Foundry No. 2

	Per Cent.
Silicon must not be less than	1.95
Sulphur must not exceed	0.04
Phosphorus should not exceed	0.70
Manganese should not exceed	0.70
Total carbon not specified.	

The carbons in No. 2 will generally range from 2.90 to 4.20 per cent. Any foundry pig No. 2 which shows on analysis less than 1.85 per cent. of silicon or more than 0.045 per cent. of sulphur should be rejected.

Foundry Pig No. 3

	Per Cent.
Silicon must not be less than	1.35
Sulphur must not exceed	0.05
Phosphorus should not exceed	0.80
Manganese should not exceed	0.90
Total carbon not specified.	

The carbons of this grade will usually be between 2.50 and 4 per cent.; if No. 3 shows on analysis less than 1.25 per cent. of silicon or more than 0.055 per cent. of sulphur, it should be rejected. All grades of pig iron should be bought by analysis instead of by fracture; you should mix by analysis in the foundry, and the pig iron should necessarily follow the specifications; furthermore, if you accept as No. 2, which fails to fill the No. 1 conditions, you might eventually be overstocked with No. 2 and be unable to get the results aimed at in the cupola mixture; consequently an iron sold as No. 1 or any other grade should be rejected if not strictly within the specifications for said grade.

Test the Pig Iron

When a car of pig is received, it should be immediately sampled by an experienced man (professional sampler) who could select a certain number of pigs from different parts of the car which according to his judgment shall represent the average quality of the iron; these pigs should be broken and drillings from the face of the fracture should be sent to the laboratory for a chemical analysis; this analysis will decide the acceptance or rejection of the iron.

In case of dispute the furnace or the seller should have the right to re-sample the iron in conjunction with the buyer, each to select five pigs. Drillings from ten pigs, after being well mixed, could be divided into three different samples, one lot to be analyzed by the furnace, one by the laboratory and one by a disinterested chemist agreed upon by the parties in dispute. The two analyses nearest alike could then be accepted as the proper chemical composition of the iron.

Methods To Be Used

The following chemical methods could be used in the laboratory, viz.:

Silicon—Drown's method.

Sulphur—Evolution and titration with iodine (volumetric) as a rapid method, and the oxidation method (gravimetric) in all cases of dispute.

Phosphorus—Emmerton's method for rapid work and the molybdate magnesia method for very accurate determinations.

Manganese—Deshay's or the colorimetric method for rapid work and the acetate process for extremely accurate work.

Carbons—Carbons are worked generally by the colorimetric and combustion methods. In case of dispute analyses could be made by gravimetric methods.

Silver Gray (S. G.) or Silicon Pig

In the following analysis you can expect a pig iron medium high in silicon and not too low in graphitic carbon; this can be used as a softener.

	Per Cent.
Silicon must not be less than	3.00
And should not be more than	5.50
Sulphur must not exceed	0.04
Phosphorus should not exceed	0.90
Manganese should not be less than	0.30
Total carbon should not be less than	2.50

Any car of S. G. iron which shows on analysis less than 3 per cent. of silicon or more than 0.055 per cent. of sulphur should be rejected.

Ferro-Silicon Pig Iron

This is a specification of a pig iron with 8 per cent. silicon; the general range for silicon in this grade is from 6 to 12 per cent.

	Per cent.
Silicon must not be less than	7.00
Or not more than	12.50
Sulphur must not exceed	0.04
Manganese not specified.	
Carbon total not specified.	

As a rule the graphite carbon would be low, carrying from 3 to 0.50 per cent. Manganese may occasionally vary from 0.20 to 3 per cent. or more. Cars should be rejected which show less than 6 per cent. of silicon or more than 0.045 per cent. of sulphur.

Manganese Pig (Manganiferous Pig)

	Per cent.
Silicon should not be less than	2.50
Sulphur must not exceed	0.04
Phosphorus should not exceed	0.70
Manganese must not be less than	0.90
Carbon not specified.	

In this specification you get an iron from 1 to 2.50 per cent. manganese; the ordinary No. 1 pig iron running about 1.50 per cent. in manganese would fill all conditions required; as a rule higher the manganese the greater the proportion of combined carbon; combined carbon may range from 0.30 to 3 per cent. while the graphitic carbon may vary from 0.40 to 3.50 per cent.

I will now make a few remarks on manganiferous irons which may help to define the dividing line between the ordinary foundry pig and the regular manganese iron. Manganese pig is an ordinary iron made from ore containing somewhat more manganese than the regular foundry irons; it will run from 0.80 to 3.50 per cent. in manganese; it is added to foundry pig, in cupola practice, to raise the combined carbon, thereby increasing the strength. In a measure it neutralizes the effect of sulphur, removes excess of gas and prevents blow holes; it must be used with caution, as a low silicon and carbon, with high manganese, gives hard iron and alters the shrinkage; spiegel iron is used mostly in steel making, it is supposed to contain from 10 to 25 per cent. of manganese, but some authorities place the range from 3.50 to 20 per cent.

Ferromanganese contains from 25 to 90 per cent. of manganese; most of the ferromanganese on the market runs about 80 per cent. of manganese. With 80 per cent. of manganese present there is not much room for iron; the metal however, usually contains sulphur, phosphorus, carbon and silicon.

In cupola practice the amount of ferromanganese used is generally very small, consequently the effect of the other metalloids is not great. Manganese has a tendency to keep the carbon in the combined form; hence it lowers the graphitic carbon, thereby reducing the deflection; it neutralizes the effect of sulphur by reducing red shortness, and indirectly offsets the cold shortness or brittleness caused by high phosphorus.

In foundry practice the more manganese present in the pig the more silicon and graphitic carbon required to produce soft castings. For "chill mixtures" where great toughness is required, a pig with 2 per cent. manganese and less than 1 per cent. silicon is a desideratum.

Malleable Bessemer Pig

This specification will cover both the "common" and "straight" malleable Bessemer; when the straight Bessemer is specified it is understood that the phosphorus is not to exceed 0.10 per cent. straight Bessemer with 1 to 1.50 per cent. of silicon, about 0.60 per cent. manganese, under 0.11 per cent. phosphorus and below 0.04 per cent. sulphur would be satisfactory; in common Bessemer the following limit is specified:

	Per cent.
Silicon may range from	0.70 to 2.10
Sulphur must not exceed	0.045
Phosphorus must not exceed	0.15
Manganese may range from	0.30 to 1.20
Total carbon should not exceed	3.75

As a rule the combined carbon will vary from 0.30 to 1.30 per cent. and the graphitic carbon from 3.45 to 1.80 per cent. The iron should be rejected if the analysis shows more than 0.05 per cent. of sulphur or more than 0.18 per cent. of phosphorus.

Phosphoric Pig Iron

Phosphoric iron is used almost exclusively for small, thin castings, where great fluidity is desired; a very fluid iron is essential in thin work, as it fills every part of the mold and gives a clear, solid casting. Iron high in phosphorus is very weak and brittle under impact (shock) consequently it cannot be used where great strength is required; with high silicon and a high graphitic carbon the phosphorus may rise to 1 per cent. in the casting, but in chilled work, with low silicon and much combined carbon, the phosphorus must be kept below 0.30 per cent.

	Per cent.
Silicon must not be less than	1.50
Sulphur must not exceed	0.055
Phosphorus must not be below	1.00
Manganese may range from	0.30 to 0.90
Total carbon should not be below	3.00

Any car of iron which shows upon analysis more than 0.06 per cent. of sulphur or less than 0.90 per cent. of phosphorus should be rejected.

FEW APPRENTICES AS MOLDERS; PROBLEMS OF THE FOUNDRY TRADE

FOUNDRY men are having problems of their own at present. They are in many cases short of material and there are not enough molders to go around. Scrap has been bought in larger quantities than usual, in fact in some cases a mixture is used in which almost fifty per cent. is scrap. To go past the 40 per cent. mark was usually considered dangerous. In fact for particular work good care has to be taken in selecting scrap at 40 per cent. mixture.

A good big supply of pig iron would be a very acceptable thing just now to the Canadian foundry trade, but instead of becoming more plentiful the supply of pig becomes more scarce, especially for plants that are not on war work. In fact it is simply a case of "old connections" that keeps some of the nonessential concerns supplied to the point of operation. There are cases where the War Trade Board at Ottawa has informed users that they cannot have a supply, and it looks as though there would be more of this sort of business.

Molders Are Scarce

Foundrymen have stated most persistently recently that the supply of molders was running out in Canada. This may be so, or it may not, but certain it is that if molders are still in the land they are not all in the molding shops. Not long ago a prominent manufacturer expressed the opinion to this paper that it was only a matter of time until the molding business passed into the hands of the foreigners.

What Foundrymen Say

Apparently the shops of the East are in no better condition than those of Ontario or the West. For instance, C. A. Lushy, secretary-treasurer of the Amherst Foundry Co., Amherst, N.S., states that, "We have considerable difficulty in getting pig iron but as we have been supplying a considerable amount of goods for the Reconstruction Committee at Halifax, which is government work, and we have also been supplying goods for use in barracks and different plants throughout the country which are manufacturing munitions, the government has allowed us to have a small percentage of pig iron compared to our normal requirements. We are using more scrap than usual and are getting so far good results. We use about 40 per cent. of scrap iron, but do not think that we could use a higher percentage without interfering with the quality of our goods."

The supply of molders is sufficient for the present, as this firm has, according to their statement, "a sufficient number of moulders to keep our foundry running under present conditions, but if we could secure all the pig iron that we could use we would require a large number of moulders above those that we now have. In regard to apprentices, we usually are able to get all that we require and we should think there should be no difficulty in finding apprentices for the moulding trade as moulders, as a class, are very well paid men. We, of course, in this part of the country, employ very little foreign labor, as our foreign population here is very small."

Another Maritime Report

T. McAvity & Sons, Ltd., of St. John, N.B., is another well known firm. They are able to secure supplies of raw material, being largely engaged on war work at present. In regard to the situation with molders G. C. McAvity states, "I fully agree that there is a growing shortage of molders, although in this section of the country we have not yet seen very much of the foreign element as moulders, although it has been practically impossible to get any young men to serve as apprentices, which, of course, we think is more or less due to the fact that they can receive a great deal more money to-day from common laborers' work, not appreciating the future."

In Brantford Shops

Goold, Shapley & Muir Co., Ltd., Brantford, are using a 40 per cent. scrap mixture and are securing good results, working very largely just now on agricultural tractors. Regarding the number of molders, W. H. Whitaker, of the company, says that, "We have some difficulty in the securing of sufficient molders and usually our floors are running three and four behind on account of the scarcity of men. We have not yet employed foreigners in this department of our work as molders. There is some truth in the statement that few young men are offering as apprentices to the molder's trade."

In other Brantford shops a decided shortage of pig iron is reported, although a fair amount of sorted scrap is on hand and is being freely drawn from. In regard to apprentices, shops have few in the molding department. In fact there is a shortage in all trades. An official of the Waterous Engine Works Co. stated to this paper that, "As far as our experience has been, it is quite true there are no apprentices. Practically no apprentices are offering for any part of our factory."

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DRAWING A LARGE CIRCLE

By M. M.

A handy compass for inscribing a large circle may be made by using a flexible board and two nails. Drive one nail at the extremity of the board, passing the same into the board underneath at the exact spot where the centre of the circle is to be. Drive another nail at the other extremity at a distance from the first exactly equal to the radius of the proposed circle, letting the same project a quarter or half an inch through the wood. With such accessory it is easier to mark off the circle than using a string owing to the fact that the rigid wooden affair does not stretch, whereas the string is very apt to do so.

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To Train Soldiers.—The Dominion Government has acceded to the request of the Woodstock branch of the Great War Veterans' Association that returned soldiers be allowed to take vocational training in the local factories. The local secretary has received notice that in future any returned soldier, whose disability prevented him from following his old occupation, might receive instruction at Government expense for a period of from three to six months, providing, however, that the training would, in the opinion of the vocation branch of the Soldiers' Civic Re-establishment Department enable the returned man to command employment in the selected occupation, and also that the factory concerned was a fit place for instruction.

Tracing the Development and Use of Semisteel

Great Use Was Made of it in France to Secure Great Amount of Munitions in 1917—Greatly Used in Auto and Truck Trade—McLain Has Much to do With it

THE progress shown and recorded in the advancement and uses of semi-steel since 1903, when the last Foundrymen's Convention was held in Milwaukee, is remarkable. It is undoubtedly true that the history of the successes of other industries is made with many obstacles and semi-steel was no exception.

For fifty years or more, foundrymen had added steel to iron in the ladle—while comparatively few melted slight amounts of steel in the cupola. According to an English authority a patent was issued on the manufacture of a new cast or wrought metal containing steel more than half a century ago, and this discovery then was acclaimed by British foundrymen generally as semi-steel. To the late Major McDowell of Chicago must be attributed the honor of placing the semi-steel process on a scientific basis and upon his great work as a foundation the accomplishments of to-day have been made possible.

But up to 1902 or 1903 no record was found where large percentage of steel was used in castings of light section. It remained for David McLain of Milwaukee to perfect experiments along this line and give to the world a metal that would be put at the top of the list of cupola or air furnace metals, and he called it semi-steel.

Until the past five years semi-steel has been ridiculed and classed as a misnomer by even some of the foremost metallurgists in the field, but to-day our government is specifying semi-steel projectiles and shells by the million.

Just about a year ago it was claimed that semi-steel shells saved France. One of the most striking cases of efficient substitution is illustrated in the French semi-steel shells replacing steel. To further show the characteristic of the French genius in meeting spontaneously an emergency, that with a sudden shortage of steel and with the greater part of their blast furnaces in enemy hands, little iron foundries were established everywhere—almost literally overnight—and the necessary output of shells thus maintained.

The best proof of its value and its existence as a distinct product is the fact that the bulk of the automobile and motor truck cylinders used in this country to-day are made from semi-steel, and it is the only metal that has been able to drive from the American market the wonderful cylinder castings shipped into this country in the past from France at fabulous prices. But the use of semi-steel not only is limited to comparatively light work. Many foundries have established a reputation for the manufacture, under high-sounding trade names, of vacuum cylinders and ammonia steel castings which, upon investigation, are found to be semi-steel. The foregoing are only a few instances of the remarkable accomplishments of semi-steel. They could be multiplied indefinitely.

The Beginning of a New Era in Metallurgy

In 1899, the Christensen Engineering Company (now the National Brake and Electric Company, Milwaukee) built their their first foundry. Gray iron, steel and brass castings were made in this plant and David McLain was the foundry superintendent for five and one-half years.

Certain parts of the air brakes were only 5-16 inch thick and tested to 200 pounds air pressure, although other engineers allowed one inch. Founders everywhere who made these castings experienced excessive losses, making it difficult for this firm to fill their orders. This was the condition when Mr. McLain was engaged. Much of the history of his experiments have been told in these columns before, so we will not dwell on this part except to emphasize the fact that he was successful in demonstrating that these castings could be made by adding 25 to 40 per cent. steel.

Mr. McLain's friends insisted that he patent his formulas, but he believed in spreading his knowledge of this metal to the foundry trade gratuitously. At that time he was anxious to enlighten foundrymen everywhere on the merits of this wonderful metal, and later, through the kindness of Mr. R. P. Tell, general manager of the National Brake & Electric Company, copies of Mr. McLain's first paper on semi-steel were typewritten and sent to foundrymen everywhere.

It was proven by later demonstration that semi-steel is a purer and stronger metal than gray iron—stands the test for government specifications for projectiles (32,000 pounds tensile)—and when used with 30 to 50 per cent. steel scrap will run as high as 40,000 and 45,000 pounds.

Prominent technical and practical foundrymen, some of whom no doubt will attend this meeting, maintained that steel reduced carbon, that it was not a good thing to use as it caused "hard spots"—that "a higher melting temperature was necessary"—"more coke required to melt it," etc. Even to-day, Mr. McLain's claim that steel melts first puzzles some chemists, metallurgists, and others, who evidently do not take into consideration that steel has a great affinity for the elements and absorbs a large quantity of carbon from the fuel.

When properly made, semi-steel exceeds in both temperature and fluidity any other mixtures melted in the cupola. Semi-steel is made in the same cupola with regular gray iron mixtures—no extra coke—special appliances—fluxes—or new equipment are necessary.

It is made in the same heat with other mixtures—it may be melted in the early part of a heat—in the middle or last part of the regular heat, or you may begin with 30 to 40 per cent. steel on the bed charge—run as much of this grade as required and then follow with 30 to 25 per cent. steel—or vice versa.

Mr. McLain claims that every industry has its science and up-to-date foundry practice is no longer guess work—it is a science. But science does not replace common sense; and in a industry like the metallurgy of iron and steel there can be no set rules that will cover the operations or the operators in the manufacture of every grade of castings. We need men with common sense to apply scientific facts to their individual requirements and local conditions.

He also claims that any man who believes that he can simply throw some steel scrap in with the pig iron and make good semi-steel has much to learn. But such is the custom in a large number of shops in which Mr. McLain is called in an advisory capacity.

Our government has specified twelve million semi-steel shells to be made, and this would require an approximate of 400,000 tons of pig iron, so it behooves every up-to-date foundyman to be able to meet government specifications and help win the war.

Another feature of semi-steel is the extraordinary uniformity of a series of samples. Although the castings are of exceedingly varying weights, some having thick sections and others very thin sections, the metal microscopically is exceedingly uniform, much more so than you find in gray iron, for the majority of foundrymen realize that where the section of a casting is light there is a tendency for the iron to be hard and brittle unless the chemical composition is modified to suit the weight of the casting.

Mr. McLain does not claim to be the first man who used steel in cupola mixtures, as for over fifty years steel was carelessly used in large castings where it did not matter how it was melted; but he has the honor of being the first man who was successful day after day in using large percentages of steel in castings of light section.

Volumes might be written abount semi steel, but the very fact that the Convention is to be held in Milwaukee will enable hundreds of foundrymen to view an exhibit of semi-steel castings made by graduates of McLain's system.

No man is tired of receiving what is useful.—Marcus Aurelius.

The Reconstruction of the Crippled Soldier

In the Past the Pension System Proved a Failure Constructively —The Only Compensation For Physical Disability is Rehabilitation For Self-support

By DOUGLAS C. McMURTRIE

Director Red Cross Institute for Crippled and Disabled Men, New York City.

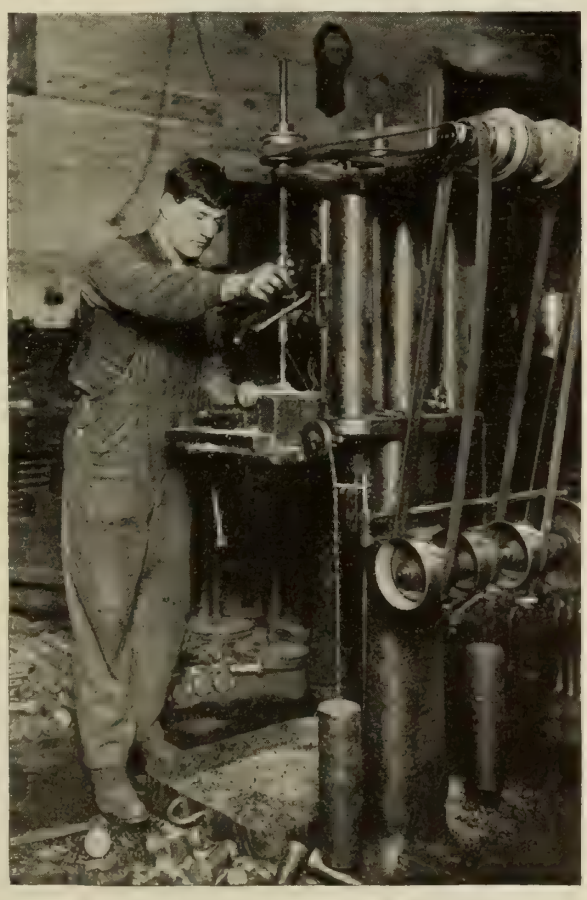
SOON after the outbreak of hostilities the European countries began the establishment of vocational training schools for the rehabilitation of disabled soldiers. They had both the humanitarian aim of restoring crippled men to the greatest possible degree and the economic aim of sparing the community the burden of unproductivity on the part of thousands of its best citizens. The movement had its inception with Mayor Edouard Herriot of the city of Lyons, France, who found it difficult to reconcile the desperate need for labor in the factories and munition works while men who had lost an arm or a leg but were otherwise strong and well were idling their time in the public squares. He therefore induced the municipal council to open an industrial school for war cripples which has proved the example and inspiration for hundreds of similar schools since founded throughout France, Italy, Germany, Great Britain and Canada.

The disability of some crippled soldiers is no bar to returning to their former trade, but the injuries of many disqualify them from pursuing again their past occupation. The schools of training prepare these men for some work in which their physical handicap will not materially interfere with theid production.

Influence of Previous Training

The education of the adult is made up largely of his working experience. The groundwork of training in his past occupation must, under no circumstances be abandoned. The new trade must be related to the former or be, perhaps, an extension or specialization of it. For example, a man who had done manual work in the building trades may be instruction in architectural drafting and the interpretation of plans be fitted for a foreman's job, in which the lack of an arm would not prove a serious handicap. A trainman who had lost a leg might wisely be prepared as a telegrapher, so that he could go back to railroad work, with the practice of which he is already familiar.

Whatever training is given must be thorough, for an adult canot be sent out to employment on the same basis as a boy apprentice. He must be adequately prepared for the work he is to undertake.



LEARNING THE OPERATION OF A DRILL PRESS.

The one-armed soldier is equipped with working appliances which have supplanted the old familiar artificial limb. The new appliances are designed with a practical aim only in view; they vary according to the trade in which the individual is to engage. For example, the appliance for a machinist would be quite different from that with which a wood turner would be provided. Some appliances have attached to the stump a chuck in which various tools or hooks can interchangeably be held. The wearer uses these devices only while at work; for evenings and holidays he is provided with a "dress arm" which is made in imitation of the lost member.

Avoid Temporary Dependence

An important factor in the success of re-educational work is an early start, so that the disabled man shall have no chance to go out unemployed into the community. In even a short period of exposure to the sentimental sympathy of family and friends his "will to work" is so broken down that it becomes difficult again to restore him to a stand of independence and ambition. For this reason therefore, the plan for his future is made at as early a date as his physical condition admits, and training is actually under way before the patient is out of the hospital.

In the readjustment of the crippled soldier to civilian life, his placement in employment is a matter of the greatest moment. In this field the employer has a very definite responsibility.

But the employer's duty is not entirely obvious. It is, on the contrary, almost diametrically opposite to what one might superficially infer it to be. The duty is not to "take care of" from patriotic motives a given number of disabled men, finding for them any odd jobs which are available, and putting the ex-soldiers in them without much regard to whether they can earn the wages paid or not.

Yet this method is all too common. A local committee of employers will deliberate about as follows: "Here are a dozen crippled soldiers for whom we must find jobs. Jones, you have a large factory; you should be able to take care of six of them. Brown, can you not find places for four of them in your warehouse? And Smith, you ought to place at least a couple in your store."

Such a procedure cannot have other than pernicious results. In the first years of war the spirit of patriotism runs high, but experience has shown that men placed on this basis alone find themselves out of a job after the war has been over several years, or in fact, after it has been in progress for a considerable period of time.

Charity Jobs Deteriorating

A second weakness in this method is that a man who is patronized by giving him a charity job comes to expect as a right such semi-gratuitous support. Such a situation breaks down rather than builds up character, and makes the man progressively a weaker rather than a stronger member of the community. We must not do our returned men such injury.

The third difficulty is that such a system does not take into account the man's future. Casual placement means employment either in a makeshift job as watchman or elevator operator such as we should certainly not offer our disabled

COACH BUILDING IN THE RAILROAD SHOPS.

men except as a last resort—or in a job beyond the man, one in which, on the cold-blooded considerations of product and wages, he cannot hold his own. Jobs of the first type have for the worker a future of monotony and discouragement. Jobs of the second type are frequently disastrous, for in them a man, instead of becoming steadily more competent and building up confidence in himself, stands still as regards improvement and loses confidence every day. When he is dropped or goes to some other employment, the job will have had for him no permanent benefit.

Twelve men sent to twelve jobs may all be seriously misplaced, while the same twelve placed with thought and wisdom and differently assigned to the same twelve jobs may be ideally located. If normal workers require expert and careful placement, crippled candidates for employment require it even more.

Employer's Duty

The positive aspect of the employer's duty is to find for the disabled man a constructive job which he can hold on the basis of competency alone. In such a job he can be self-respecting, be happy, and look forward to a future. This is the definite patriotic duty. It is not so easy of execution as telling a superintendent to take care of four men, but there is infinitely more satisfaction to the employer in the results, and infinitely greater advantage to the employee. And it is entirely practical, even in dealing with seriously disabled men.

A cripple is only debarred by his disability from performing certain operations. In the operations which he can perform, the disabled man will be just as efficient as his non-handicapped colleague, or more so. In the multiplicity or modern industrial processes it is quite possible to find jobs not requiring the operations from which any given type of cripples are debarred. For such jobs as they can fill the cripple should be given preference.

Thousands of cripples are now holding important jobs in the industrial world. But they are men of exceptional character and initiative and have, in general, made their way in spite of employers rather than because of them. Too many employers are ready to give the cripple alms, but not willing to expend the thought necessary to place him in a suitable job. This attitude has helped to make many cripples dependent. With our new responsibilities to the men disabled in fighting for us, the point of view must certainly be changed. What some cripples have done, other cripples can do—if only given an even chance.

The industrial cripple should be considered as well as the military cripple. for in these days of national demand for the greatest possible output there should not be left idle any men who can be made into productive workers.

With thoughtful placement effort, many men can be employed directly on the basis of their past experience. With the disabled soldiers who profit by the training facilities the Government will provide, the task should be even easier.

A Patriotic Duty

This, then, constitutes the charge of patriotic duty upon the employer:

To study the jobs under his jurisdiction to determine what ones might be satisfactorily held by cripples. To give the cripples preference for these jobs. To consider thoughtfully the applications of disabled men for employment, bearing in mind the importance of utilizing to as great an extent as possible labor which would otherwise be unproductive. To do the returned soldier the honor of offering him real employment, rather than proffering him the ignominy of a charity job.

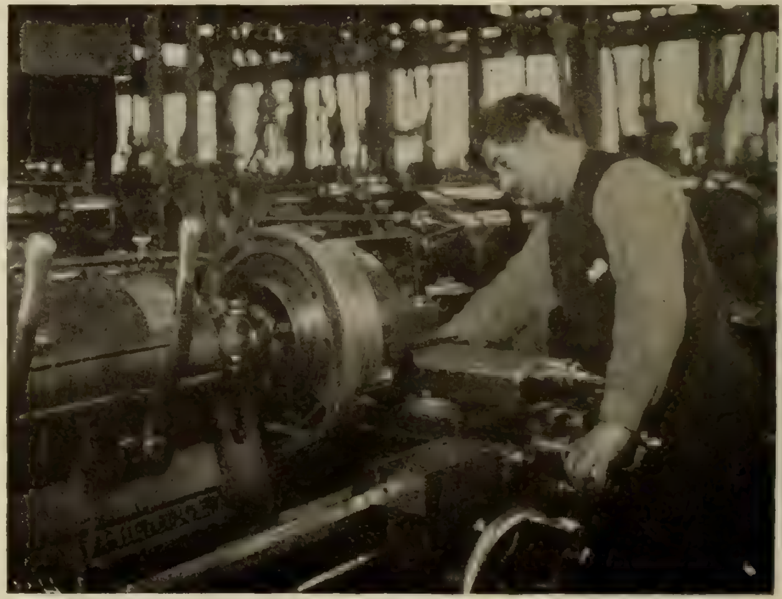
If the employer will do this, it will be a great factor in making the complete elimination of the dependent cripple a real and inspiring possibility.

◆

A POINT deserving of attention from brass founders is the marking of runners with a certain mark for each class and mixture of metal. In some cases the molder can put a certain mark with his tools, but if a stamp be used to denote each particular mixture, the men who chip off the runners can easily distinguish what class of metal it is made from, and the scrap gates can be kept quite separate.

◆

Energy will do anything that can be done in this world.—Goethe.



RECEIVING INSTRUCTION IN THE MACHINISTS' TRADE.

Laws Governing the Fluidity of Molten Cast Iron

Fluidity Depends on Several Factors Which Affect the Melting Point—The Author, in a Paper Read Before the British Foundrymen's Association, Explains Some of the Vagaries in the Operation of the Cupola

By MATTHEW RIDELL

THE many varied and widely divergent views which are held by experienced foundrymen concerning the correct construction and the proper manipulation of the cupola are too well known to need recounting. The mere fact that after so many years of experience and discussion there should be still such diversity of opinion on this topic is noteworthy. It would seem to indicate that either the cupola, or its process, is not the simple matter it appears to be, and that some more scientific explanation than common sense is required for the solution of the problem.

The fluidity of cast iron depends on the amount of superheat or number of degrees of temperature over and above its freezing temperature that has been imparted to it in the cupola. The greater the superheat the greater will be the fluidity or degrees of life possessed by the metal, and, other things being equal, the longer will it remain fluid to fill up the intricacies of the mold.

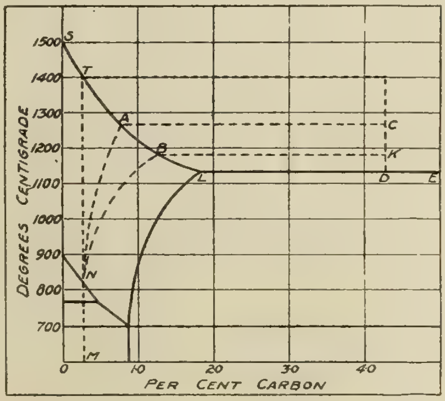
Dull Iron

When the metal runs dull from the cupola and is sluggish, its degrees of temperature or life are not far removed from the solidifying temperature. It is deficient in superheat. The reasons which one may hear ascribed in the foundry for the poor working of the cupola are many and various. Some blame the air supply as too great or too strong; others would have the quantity or pressure reduced; but the majority, recognizing that the coke plays a most important part in the production of heat, and knowing that the manager is prompted by considerations of economy in the use of this material, are inclined to conclude that economy has been carried too far. To these the sure remedy is more coke. It seems but natural to suppose that an increase of coke ought to result in a larger amount of heat being developed in the cupola. No doubt it does so result, but repeated experience shows that after a certain limit of coke in the charge has been reached further additions appear to make the metal more dull instead of more fluid. This and some other peculiarities of the cupola which seem to defy common sense explanations have for a long time puzzled the writer, and the solution herein advanced occurred to him while investigating the problem in connection with semisteel difficulties.

Among the peculiarities which the present argument appears to solve satisfactorily may be mentioned the following: Better results are obtained in securing hot metal when the bed coke is not well lighted above the tuyeres, before the blast is put on and the first iron takes longer to come down, than are secured when the opposite conditions prevail. Many foundrymen have noted this peculiarity, but explanations have not been satisfying. Also, it has been noted that foundry irons with high silicon are generally fluid, while those with high sulphur are inclined to be sluggish when melted under similar cupola conditions. It appears generally to be taken for granted that the actual temperature at the spout of these different classes of irons is the same, or approximately so, in all cases, and that the fluidity or sluggishness of the metal is due to some inherent quality of the respective elements—silicon and sulphur.

Not Satisfactory for Superheat

An examination of the cupola and of its load will show that as an instrument for imparting superheat to a molten metal it is as unsatisfactory an arrangement as could have been devised. It is divided into three zones, as follows: (1) The bed into which the metal flows as soon as it is melted; (2) the melting zone where the maximum heat is developed and the solid metal converted to the fluid state; and (3) the stack wherein the descending charge is being heated by the ascending gases.



EQUILIBRIUM DIAGRAM

From the foregoing it will be noted that the point at which the temperature is high enough to melt the solid iron is well removed from and over the basin or well into which it flows when melted. After the door of the cupola has been made up there is no combustion going on in the bed coke below the tuyeres and, therefore, no heat is being generated in that quarter. So soon as the metal reaches its melting temperature and becomes fluid in the melting zone it passes rapidly away from this high-temperature zone into the basin at the bottom of the bed. In some cases it passes out of the cupola altogether, and consequently cannot come under the influence of subsequent heat. What little superheat the metal may have acquired at the region of maximum temperature is largely discounted in its journey to the bottom of the cupola. Besides having to pass the tuyeres, which are discharging large quantities of cold air into the furnace, it will have to part with some of its heat to the coke which makes up the bed. If there was nothing more involved in the melting of metal in the cupola than the question of heat it would be extremely difficult to account for one kind of iron coming out more fluid, and therefore hotter, than an iron of a different class. Under similar conditions of melting all metals should have imparted to them the same degrees of heat.

It is a common belief that all substances which pass from the solid to the liquid state and vice versa make these reverse changes at the same temperatures. For instance, ice becomes water when the temperature begins to exceed 0 degrees Cent. and water changes back into ice as the temperature begins to be less than 0 degrees Cent. Every substance has its own melting and freezing points which are supposed to be identical for each substance. This assertion is true of all simple bodies or of alloys which retain their components in solid solution. It is because pig or cast iron is an exception to the rule that the cupola is practicable at all as a melting instrument. If any of the materials which adhere to the rule were melted in the cupola they would probably resolidify in the bed, or at the best would come out of the cupola so dull as to be useless for casting purposes owing to the lack of superheat or life.

To investigate the behavior of cast iron in the cupola and to ascertain, if possible, why it should be an exception to the general rule, it will be necessary to refer to the accompanying equilibrium diagram and the information it gives concerning the iron-carbon series of alloys.

The main fact to be noted is that both the melting and freezing temperatures depend on the amount of carbon in the alloy, that is, the amount of carbon in solution in the iron at the time. The lower the amount of carbon which is in solution the higher is the temperature at which the changes of state take place, The lowest freezing or melting temperature is at about 1130 degrees Cent., but it is only such an alloy as has about 4.3 per cent. carbon to 95.7 per cent. iron that will freeze or melt at that temperature. An increase in the amount of either of the elements in solution results in an increase of the temperature at which the changes take place, 4.3 per cent. is the saturation point of carbon in iron when these two elements are reckoned alone. With ordinary pig irons this figure obviously requires adjustment on account of the presence, in greater or lesser quantities, of other elements. For the purpose of the present argument it may be taken for granted that foundry irons contain very near the saturation amount of total carbon. If all the carbon of a 4.3 per cent. total carbon or saturated cast iron were in solution or combined with the iron, the metal should melt or freeze at about the temperature of 1130 degrees Cent. Fortunately for the reputation of the cupola the carbon in pig iron is found separated out as graphite as well as being in solution or combined in the iron.

Melting Temperature

As the melting temperature is determined by the amount of carbon in solution only in the iron at the time it reaches the melting zone, the free graphite is left out of account. It follows, therefore, that an iron which is very low in combined carbon, although high in total carbon, cannot be melted until a very high temperature is reached. The mass or body of metal will remain in the solid condition until the high temperature is attained, and consequently the liquid metal will be extremely hot. In the course of melting the free graphite is rapidly dissolved and enters into solution with the iron, with the result that the molten mass has a high percentage of combined carbon and therefore a low freezing point. Under such conditions an iron which will not melt until it has been heated to, say, 1400 degrees Cent., does not freeze again until the temperature has fallen to about 1130 degrees. Such a metal may be said to have 270 degrees of life and will appear fluid.

If, on the other hand, the combined carbon in the pig iron is already high, the temperature at which melting begins will be low, and even after the free graphite is dissolved will possess only a few degrees of life or superheat.

Another point which the writer would like to emphasize is that it is the amount of carbon in solution at the time the metal enters the melting zone and not necessarily that of the original iron charged into the cupola that determines the temperature which will be attained in the process of melting. It has to be borne in mind that after iron has reached a certain temperature much below its melting poin andt has been converted into gamma iron it dissolves carbon very readily. This implies that if in the course of heating, graphite is being reduced while the percentage of the combined carbon is increasing in the iron, the melting point will be lower than indicated by the original analysis. It is obvious that in order to obtain the hottest melted metal it is essential to get the unmelted iron into the melting zone as quickly as possible. The absorption of the graphite is not instantaneous, but the rate at which it takes place increases as the temperature rises. When, therefore the descent down the stack is slow and the metal is held above the melting zone through excessive coke in the charges, the iron is afforded an opportunity to dissolve the graphite, with the result that the material enters the zone with a lower melting temperature than it otherwise would have had. One can see from this an explanation of why excess coke results in duller instead of more fluid iron. The same explanation applies to the bed coke. If this is too high, or if the bed is so burned up that the metal is brought to a red heat, in many instances little short of actual melting, before the blast is turned on, the amount of graphite that has entered into solution will be considerable, and the pig will melt at a comparatively low temperature. So long as the first charge is resting on coke which is not yet alight when the blast is turned on, its combined carbon is unchanged, and the quick combustion of the coke by the blast raises the maximum temperature in the cupola before the absorption of graphite has been able to proceed along very far.

The theory likewise explains the reason of the differences in the fluidity of siliceous irons, as it is only necessary to take into account the accepted actions of silicon and sulphur with regard to the solubility of carbon in iron. Silicon by reducing the solubility makes it more difficult for the graphite to become absorbed while the temperature is being raised, while the influence excited by sulphur is all in favor of combined carbon.

Source of Superheat

In a previous paper on the subject of semi-steel, the writer, arguing from the equilibrium diagram, advocated the use of high carbon steel, such as files, etc., because of the greater ease and lower temperatures at which such material could be melted. Experience has proved that the results to be obtained from mild or low carbon steel are superior to those which the use of files will afford. Does not the theory here offered suggest an explanation in that the question of superheat and its source was overlooked? The high carbon steel with all the carbon in the combined form would have a lower melting temperature than the pig iron itself, and its influence would be to impart a dullness to the molten mass, and so render its homogeneity more uncertain. In the case of phosphoric irons, in which the fluidity is such a marked feature, it is necessary to look to the diluting effect of the phosphide eutectic. The phosphide eutetic becomes fluid at about 950 degrees Cent., and so long as it remains entrapped in the otherwise solid metal it is acquiring superheat and increasing its fluidity accordingly. As this phosphide eutectic may constitute 15 per cent., or even more of the mass under treatment, the diluting effect of such a considerable volume of highly fluid material is manifest.

Conclusions Reached

The foregoing statements may be summarized briefly as follows:

The fluidity of cast iron depends on the degrees of heat which it has attained in excess of the freezing temperature.

The cupola is not suited to impart directly superheat or fluidity to any material which is being melted therein.

While the freezing temperature of foundry irons for all practice purposes, may be taken as constant, at about 1130 degrees Cent., the melting temperature varies, and is regulated by the amount of carbon in combination or solution when the material enters the melting zone.

In view of the gradual absorption of carbon into the iron as the temperature rises the practical conclusion suggests itself that in order to obtain the molten metal in the most fluid condition the solid material in the cupola should be introduced into the melting zone as quickly as possible.

Excess of coke in the charges, too much coke in the bed or too fierce burning of the bed before blast is turned on must result in dulling the iron.

Equilibrium Diagram

On the accompanying diagram an attempt is made to illustrate graphically the principal features of the foregoing remarks. SLDE is the solidus curve of the equilibrium diagram. Any alloy of iron and carbon whose ordinates of concentration and temperature intersect below the curve can normally exist in a completely solid state. Before the alloy can become in any way liquid the ordinates must intersect above the solidus curve. Above SDE the alloy is completely liquid and begins to solidify, when the ordinates of concentration and temperatures intersect on the curve.

The dotted curves represent the melting and freezing processes of an iron with 0.3 per cent. combined carbon, 4 per cent. graphite carbon, the balance of 95.7 per cent. being assumed to consist of iron only.

If the temperature of the solid metal is raised without change taking place in the carbon arrangement it will attain to 1400 degrees Cent. before the metal will begin to melt, as indicated by the dotted line MNT. The curves MNA and MNB show the difference brought about in the temperature at which the metal begins to melt, through free carbon being absorbed in solid solution in the iron while the mass is accumulating heat. After the temperatures TAB have been acquired, and as the metal melts the remaining free carbon is rapidly dissolved as indicated by TF, AC and BK. The liquid solutions each containing 4.3 carbon in combination have temperatures F, C, and K, respectively, but all begin to freeze at the same temperature D (1130 degrees Cent.) The superheat or fluidity of the first is FD, which is greater than that of the second, CD, and still greater than that of the third, KD.

Importance of Diagram

Dr. W. H. Hatfield complimented the author on the development of the equilibrium diagram, adding that he entirely confirmed what Mr. Riddell had said concerning its importance. From the metallurgical standpoint it was impossible to understand the properties of cast iron until the diagram had been properly studied. Prior to writing his book on Cast Iron Dr. Hatfield spent three years in following through the evolution of the diagram. However, he was unable entirely to follow Mr. Riddell in his deductions. The diagram was constructed on cooling curves of alloys containing from nothing to 5 per cent. of carbon. Mr. Riddell had been deducing his conclusions from the properties of low carbon alloys, namely, steel containing 0.2 to 0.9 per cent. of carbon. The term equilibrium must first be understood, added Dr. Hatfield. It means that if an alloy is maintained for a sufficiently long period at a certain temperature certain phases or conditions will be realized. The D point on the diagrams is the eutectic and if 4.3 per cent. of carbon is in a carbon alloy, freezing would take place at about 1130 degrees; but in ordinary cast iron containing from 1 to 3 per cent. of silicon, the freezing point of the iron is modified. The first results of added silicon is to reduce the solubility of carbon. If an iron containing 3 per cent. of silicon with, say 3.2 per cent. of carbon was gradually raised in temperature it would be found that the carbon absorbed would be in conformity with the diagram. Dr. Hatfield could not agree with the theory that with the cupola it is possible to heat a piece of cast iron to a temperature so high as had been indicated without fusion taking place. He suggested that Mr. Riddell reconsider his theory in the light of the suggestions offered and he thought he would find that equilibrium would be attained much more readily than was stated in the paper. In actual foundry operations ordinary foundry iron containing 1.5 per cent. of phosphorus could be melted in a much shorter time than Mr. Riddell had said, and the smallest articles could be cast therefrom, the degree of superheat being sufficient.

Experiments in Melting Iron

Mr. Riddell said that his equilibrium diagram was built-up in the simplest possible way and he did not believe that the changes took place so rapidly as Dr. Hatfield indicated. He had personally conducted some experiments in melting crucible iron at different rates in order to ascertain the temperature to which he could raise it before it became fluid. But he agreed that the presence of silicon reduced the rate of progress and promoted fluidity in cast iron.

Hot Iron Soft

R. Carrick said he would like to draw attention to certain statements made by Dr. Hatfield. Although he was not a metallurgist he had made thousands of practical tests of cast iron and he had never yet found that the higher the temperature of cast iron the more likely hard iron was to be obtained. He thought Dr. Hatfield might offer, at some future time, a further explanation. Mr. Carrick had tested for hardness with the Brinell and other machines and his own experience certainly did not confirm that statement. He thought most foundrymen agreed that the hotter they cast the iron the softer it would be. Leaving aside the question of chemical content he thought mechanical tests would confirm that theory.

Effect of Temperature

Dr. Hatfield replying to further remarks said that his statement with regard to the effect of temperature was based upon actual experiment and observation, and many of those experiments could be easily carried out. He had found that iron cast hot was distinctly harder than iron cast cold. He could give actual experimental data in support of that statement. His experiments consisted of a gradual increase in the silicon content and he really did the work primarily to see how the results compared with those published by Professor Turner in 1881. He increased the silicon content by stages of 0.25, 0.50 and 0.75 per cent. up to 3 per cent. of silicon, and then he determined the result by fracturing the casting and testing both the combined carbon and the mechanical properties. One thing he discovered was that the gradual addition to the silicon content did not result in a gradual precipitation of the graphitic carbon. In his remaining series of experiments he found that the combined carbon remained at a high maximum well over 3 per cent. until a certain silicon content was reached, and then he found a rapid drop. In that series the casting was done at a fairly cold temperature. In the next series with the silicon contents identical he cast much hotter and he found that the combined carbon persisted until the higher silicon content was reached and that was confirmed over and over again in works practice. If they had a very heavy casting with a sufficiently high silicon the effect of casting temperature would be different because they would always have a maximum softness.

F. J. Cook said that Dr. Hatfield's concluding remarks contained the crux of the whole subject. It was not only a question of hot or cold casting temperature, but also a question of the rate of cooling. When dealing with hard iron which cooled quickly, as for superheated steam engine cylinders, the metal was susceptible to hardness and, therefore, susceptible to the influence of the rate of cooling. If they were not careful they got very hard iron before they were aware of it. If the range of cooling was increased the possibility of softness was increased. He did not wish to throw doubt upon what Dr. Hatfield had said, but personally he had cast thousands of cylinders and there was no doubt that in casting cylinders with metal of the kind he had described at a high temperature they would be more easily machinable than if cast with metal of the same analysis cast cold. That was due simply to the different rate of cooling rather than temperature effect.

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SUBSTITUTED METALS IN ELECTRICAL ENGINEERING

A German technical contemporary has been giving some interesting details of the shortage of metals within the German borders, and the steps taken to remedy the evil in the electrical industry. Attempts have been made to expand the restricted supply of zinc by adding other metals, but iron has not given good results. In any case the alloy must contain about 90 per cent. of zinc, and not more than 3 per cent. of aluminum can be added without the risk of pitting. A zinc alloy containing about 6 per cent. of copper and 3 per cent. of aluminum has been found as a suitable material for casting for many purposes, though not for constructional work. For galvanizing with zinc, Schoop's process is used. The melted zinc is sprayed by means of compressed air (3½ atmospheres) in an atmosphere of coal gas on to the iron, which is heated to 70 deg. or 80 deg. Cent. The process may also be available for applying coatings of aluminum, tin, copper, and some other metals. The consumption of tin in Germany is about 21,500 tons per annum, about 70 per cent. of which is lacking, after taking into account the tin recovered from tin-plate waste, etc. For the delivery of this tin treatment with dry chlorine gas has proved the best method, since it converts the tin into chloride without materially attacking the iron. As a substitute for ordinary solder a mixture of 10 per cent. tin, 10 per cent. cadmium, and 80 per cent. lead is recommended. More recently a cadmium solder containing only 2 per cent. of tin and an antimony solder free from tin have been prepared. In 1913 the world's production of aluminum was 78,000 tons, of which Germany produced 15,300 tons. The impurities in the metal, mainly calcium and aluminum oxide, have now been reduced to about 0.4 to 0.5 per cent. The copper for electric cables has now been replaced by a steel core round which are twisted six aluminum strands. Iron has also taken the place of copper for electro blocks for illustrations, and prophoric alloys containing about 30 per cent. of iron are used with tinder as a substitute for matches.

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The Milwaukee Convention

A NUMBER of Canadian foundrymen will be in attendance at the session of the American Foundrymen's Association in Milwaukee, commencing on the seventh day of October. It is peculiarly fitting that the foundrymen of the two countries should come together this year.

United States foundries are short on certain kinds of raw material. Canadian shops can report the same condition. U. S. molders are using more scrap to-day than they ever did before, and the molder in Canada is doing the same thing.

The foundry trade in Canada was not out looking for war with Germany, neither was the foundry trade of United States. But war with Germany came, and there was only one thing to do, viz., meet it. And for years the struggle did not look bright. There were forty years of careful and sinister preparation behind the German campaign; there were methods and devices in machinery of execution and devastation that we had not dreamed of; there were guns that could smash the forts on the continent that had for years been living in the fool atmosphere that labelled them impregnable; there were gases and fires, tortures and hell flames that only the hand of a degenerate could fashion or the mind of a fiend design.

And that August of 1914. War! War with Germany, with Austria, Hungary, Turkey, Bulgaria. And the Triple Alliance had reckoned on a split in India that would amount to another mutiny, to trouble in Canada, to German propaganda to hold United States neutral, and to a disturbance from the Irish question that would make for civil war in the Old Land. Yes, Potsdam had left nothing undone in the way of plans and plots. Every trail of graft, sabotage, arson, rape and plunder that has been uncovered in the last four years has led straight to Potsdam, and as the war progresses the slimy trail has not diverged from that suburb of Berlin.

And down went Luxemburg, then Belgium. How we watched to see if Liege would stand, and then Namur. But they went. But they couldn't take Antwerp. That was proof against invasion. But it tumbled one day before the German war machine. And the north of France went under, and the force swept on down toward Paris. And every day brought Paris a day's march nearer to Berlin domination. Then came the Marne and the turning back of the Hun.

The Balkan resistance was tragic. Servia fought well, but her army had its limits, and the German trail, covering Belgium, and the north of France, sprawled over the little state that has been the cockpit of many of the Balkan wars. And Rumania? Betrayed and beaten, but not conquered. Then the Russian debacle, where German gold did what the German army could not do.

Successes were offset by defeats for the Allies. There was lack of unity of command. There were jealousies that should never have existed. There were three or four different armies where they should have been going in as one. But still there was that dogged determination all through that there were only two paths and two ways, to go on or go under, and the Allies chose the former.

United States didn't seek war. She did everything in her power to avoid it. But there is a point past which a nation cannot with safety go in the matter of avoiding war, and the great republic to the south of us saw that point and halted the program of discussion of crime and the deliberation over murder. United States undertook a righteous war, and she is to-day shedding her blood to put down forever the same menace that has been threatening the Allies ever since the first day of August, 1914.

The people of Canada feel and recognize that the people of United States realize the sacrifice that this country has made. Certain it is that there is developing in this country a profound admiration for the way in which the American nation has thrown its vast resources and its great and virile strength into the struggle. We hear mighty little talk here nowadays about Yankee bluff. We know the Americans are not bluffing. We know they are going into this thing, as we are, right up to the neck, and that they are going to stay there until the iron heel of Prussianism is removed from the neck of Belgium, until Russia has a chance to come to her senses, until the Balkans have their future assured, until Turkey is kicked bag and baggage out of Europe to the very verge of the hell that awaits her for the damnable trail of murder, assassination and butchery toward the Armenian people.

Yes, there's a lot to fight for, and there's a long trip yet before it's over, but it's going to be cleared up. Don't make any mistake about that. It's not going to be a draw. It couldn't be. As sure as there is a God in heaven the Allies have got to win this war or justice has been banished from the face of the earth.

And it's fitting as the foundry interests come together that the men of United States and Canada should think and talk of these things. It will do a lot of good. There have been differences in the past, but through them all there still stands three thousand miles of unprotected border between Canada and the Republic. And don't forget, that on this trip to Berlin, Canada and United States are going it together.

PLATING AND POLISHING DEPARTMENT

Took An Earthquake To Wake This Firm Up

Plating Shop Was Turning Out Poor Work by Old Methods—Expert Was Called in Who Had No Particular Interest in Any Supply House—What Happened?

By ABE WINTERS

DURING the year 1915 the plating industry in Canada began to feel the first real effect of labor scarcity as a direct result of the present war. The situation at that time was met without very serious consideration on the part of the manufacturer. The foremen were relied upon to secure desirable men to fill vacancies as they occurred. In 1916 various firms throughout the provinces of Ontario and Quebec resolved to try female labor and invariably placed the women at preparatory work, such as stringing, scouring or washing. While engaged in these duties the respective qualifications of the women were noted by the foremen, and as opportunities permitted advancement the more industrious of the women were given more responsible positions. Generally speaking the newcomers were remarkably satisfactory and attended to the duties assigned them with care, neatness and dispatch. In many cases women were required to work under conditions absolutely unsanitary, they were required to undertake the cleansing of metal surfaces by the use of strong caustics where no provision had been made to protect their hands from the action of the liquid, acids destroyed their clothes, poisonous fumes caused them to become ill and weak. Where such conditions were remedied the women have actually revolutionized certain phases of the plating business, firms who were so short sighted as to ignore the requests of the foremen with reference to improved conditions have paid heavily by reason of cancelled orders, high wages to less capable men and the establishment of a reputation for meanness which will adhere to them long after the conclusion of the European horror. Each succeeding month since the close of the year 1916 has brought a lessening of desirable male applicants for positions in the plating industry, the result as viewed to-day is, greater number of female workers and improved methods of processing the various wares.

Get The New Ways

It is the latter with which we wish to deal in this article, our intention being to awaken the foremen and superintendents who have heedlessly allowed valuable time and money to be spent in the slow processing of their firms' products by inexperienced labor. Naturally the greater the number of operations necessary to prepare a piece of metal for plating the greater the labor involved and more attention required to maintain proper working conditions of the dips and plating baths. By eliminating dipping operations which have become more or less unnecessary by reason of greater efficiency of cleaning processes as effected by modern methods employing prepared cleaning compounds, we find that equally as fine finishes may be produced as by the more laborious method. Continuously dipping even small batches of metal wares all day proves very tiring to the most robust female. A dip to be of value must consist of something which costs money to prepare, its maintenance must therefore mean expense. It requires floor space, its use consumes time and enery, yet we use it because we have regarded it as absolutely essential for the past ten, fifteen or twenty years. We scour the polished steel, brass or copper before plating because we have done so successfully in the past, or because the firm refuses to install sufficient power to operate an electric cleaner. Possibly we have tried the electro-cleaning method and our experience convinced us it was not adapted to our specific requirements. In fact we have become firmly set in a groove and it will require something radically more serious than a mere labor shortage to move us along new or more progressive ways.

A Regular Nightmare

By way of illustrating the point under consideration let us visit a certain plating plant located in a portion of Ontario where factory labor is not more difficult to obtain than in Toronto. In 1916 this plant employed six men in the various operations of cleaning, plating and coloring. The plating room was actually filthy, the hours uncertain and usually long, wages were low, labor very incompetent, electrical equipment shamefully crude, methods antiquated and slow, and the results were increasingly unsatisfactory to the firm. At last the foreman severed his connection with the firm and real trouble began, the season was cold, solutions were deficient in metal, deposits formed slowly and were brittle, pitted, peeled and very dark, difficult to color, buffers groaned and cursed, new men employed to straighten out the chain of difficulties quit the firm disgusted. But the firm did not awaken to the loud noise; they simply continued to demand production from the superintendent, who, by the way, was not a live wire. After weeks of floundering upon a sea of disappointments, the manager decided to assume direct charge of affairs and locate the cause of the trouble, then remove the same and get the plant running on a paying basis again. Orders were now piled high on the desks, many were cancelled, everybody was frantic.

A Disinterested Person

An expert in plating who was not attached to any supply house, was called in. He looked over the plant, diagnosed the disease and prescribed a cure. The remedy was a simple one but demanded immediate action and a general turnover of the entire plating plant. The metal to be plated was mostly steel and iron. Prior to the investigation the method of preparing the goods for a nickel finish was as follows: Polished on four wheels, cleaned by brushing in luke warm solution of mild alkali, brass plated in cold solution for thirty minutes, copper plated in acid copper solution for thirty minutes, buffed, cleaned again by brushing in mild alkaline solution, then placed in cold double sulphate nickel solution for thirty minutes. The result was never entirely satisfactory to the firm or the customer as the total of the three deposits did equal the corrosion resisting properties of one good deposit of either metal employed. The plant was closed down on Friday evening and a gang of six men began to clean up and rearrange the equipment as suggested by the expert.

Not Blue Monday

On Monday morning the plant resumed operations along different lines. The sanitary conditions were vastly improved, polishing operations reduced to two wheels, brass plating eliminated, hot copper replaced cold acid copper, hot single nickel salt solution replaced the cold double sulphate solution, an electric cleaner cleaned the work in one-half the time previously required for the operation, copper buffing operation was eliminated and the final finish was equally as pleasing. It was found necessary to reduce the plating room staff to two men and one woman before the end of the first week under the new system owing to the fact that the plating department had actually caught up with the work and under improved system three employees would process more parts in a given time than six employees had formerly been able to do. The change cost the company approximately $300.00. Business losses pending deliberations were over $4,000.00. The actual saving in labor alone over a period of six weeks more than equalled the cost of overhauling the plant and to-day the firm are on easy street with reference to their plating problems. This case was extremely simple and yet proved expensive when disregarded. There are scores of plating plants which may be overhauled with equally as beneficial results, and with no serious interruption in production.

(To be concluded next month.)

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Questions and Answers

Question.—As a subscriber to your valuable paper may we ask for the following information:

We are preparing to install a new nickel bath in our plating room. The tank dimensions are: length, 72 inches; width, 36 inches; depth, 24 inches. We would like to know, first, how many pounds of nickel anodes, 8 in. by 20 in., it will take to equip the tank to produce nickel deposits of good quality? About how many anodes would be required? We have a dynamo of 125 ampere capacity. Will this be too small? What kind of dynamo should we have, and what ampere capacity would be advisable?

We would add that the goods to be nickeled consist of cast iron stove plate. May we also ask where we can procure a book describing all operations of polishing and plating?

Answer.—You do not state whether you intend operating the nickel tank with two or three rods of anodes. We would judge from the nature of your product and the width of the new tank that you will use the tank with five rods, two for castings to be nickeled and three for anodes. If you operate with three rows of anodes you will require 25 anodes 8 in. by 20 in. Hang 8 anodes on each outside rod and 9 anodes on center rod, the reason for using the extra anode on center rod is that the center anodes plate both ways and it is good practice to hang as many anodes on the center rod as possible. It is false economy to equip a nickel plating tank with small anode surface. Also remember that but one side, or about one-half the surface of the anodes on outside rods is really effective anode surface. On center rod you have 8"x20"x2x9=20 sq. ft. plus 2 sq. ft. as edges when newly equipped. On each side rod the anode surface would be 8"x20"x8=approx 9 sq. ft. plus 1.7 sq. foot as edges, therefore on the two side rods you would have a total of approximately 21.4 sq. feet of effective anode surface, while on the center rod the total effective anode surface would be 22 sq. feet. Now, in calculating the anode requirements for a nickel plating tank of any dimension we do not take into consideration the weight of the anodes unless we wish to figure costs. The weight of the anode is not an important factor in the actual efficiency of the anode while in use as a source of metal for plating. The effective surface area is the all important point, the larger the effective surface area of the anode ,the more economical to operate. With small anode surfaces the capacity of the tank is reduced. Why operate a 200-gallon solution with small anode surface and process only one-half or three-fourths the quantity of goods in a given time that would be possible with larger anode surface? Your tank will permit a working volume of 210 to 215 imperial gallons of nickel solution and figuring 6 gallons of solution to 1 sq. foot of cathode surface you should be able to process 35 sq. feet cathode surface per load with three rods of anodes. We have found the total effective anode surface (3 rows) to be 21.7+22 sq. ft. or 43.7 square feet, and with 35 square feet of cathode surface you will have an anode surface of over 8 square ft. in excess of your cathode surface. This condition is theoretically and practically correct.

Nickel anodes 8 in. by 20 in. weigh approximately 28 pounds each. If you use three anode rods or a total of 25 anodes your anode requirements by weight would be 700 pounds. By maintaining a large anode surface you decrease the amount of nickel salts necessary to keep the metallic strength of the bath constant and uniform. The anode even at present prices is the cheapest source of metal supply for a nickel bath.

As regards the 125-amphere dynamo, it would be too small to operate this new tank with three rods of anodes, as you will see by the following: An ordinary double sulphate nickel solution will allow at least 4 ampheres per square foot to be used on cast iron, 35x4=140 amperes. By using a more concentrated solution, one prepared by adding nickel sulphate and boric acid you could easily operate the tank of solution with a current of from 280 to 300 amperes per load and finish the batch in less time. We prefer the compound wound dynamo for stove plating. The compound wound machine is less liable to cause trouble where inexperienced help is employed. In selecting a machine, get one of recent manufacture as some compound wound machines of early design proved very troublesome because of their liability to generate a reverse current. We would not advise a dynamo of less than 250 amperes capacity at 5 volts. If you have any indication of increased output for the future we would strongly advise a 500-ampere machine, compound wound, multipolar, 5 or 6 volts. The difference in cost of the 250-ampere machine and the 500-mapere machine will cost less than one hundred dollars and you have the advantage of the extra power in case of emergency. We will be pleased to advise you regarding the selection of a reliable machine if you wish to refer the matter to us. If you decide to equip the new nickel tank with less anodes than we recommend and process smaller loads per batch, you may be able to make the 125-ampere dynamo answer your purpose for the present. There is no book published which covers the entire field of polishing and plating as practised today. The best book, in our opinion, is "Polishing and Plating," written by Herbert J. Hawkins, published by Hazlitt and Walker, Chicago, Illinois, U.S.A. Price $2.00. The methods described in most books with reference to plating are more or less antiquated. Practical plating as now carried on in the industries is the result of skill and studious research and experiments on the part of progressive electro-platers and electro-chemists during the past ten years. The columns of the CANADIAN FOUNDRYMAN are at your service when you require information relative to the casting or finishing of metals.

* * *

Question.—I have charge of the plating department in a factory producing large quantities of steel nuts, bolts, screws and threaded bars. These pieces are hardened and when received in the plating room the threads are very badly filled with a hard substance which I am told is burnt cyanide. Ordinary methods of cleaning do not affect this substance, and if the parts are plated without removing the hard substance the nickel forms over it to a certain extent and produces a condition which renders the assembling of these threaded parts practically impossible. I have heretofore removed the bulk of this scale or burnt cyanide by pickling and brushing with wire brush, but scarcity of labor and high price of acid has caused the firm to interest themselves and they have requested me to write you explaining the trouble and solicit your advice regarding steps to overcome the present conditions.

Answer.—Your firm have evidently made the mistake common to most concerns engaged in electroplating their manufactured product: Blamed the plater for results he should not be held responsible for. You admit that the source of your trouble is in the heat treatment. Then a very logical thing to do would be to correct the methods of heat treatment with respect to such threaded pieces as cause trouble. We infer that your method of hardening these nuts, bolts, etc., is by application of cyanide to the hot metal while in a furnace, and with a very disastrous effect on the furnace lining. To produce a clean thread by cyanide hardening procure a cast iron pot of dimensions suitable to facilitate handling a reasonable quantity at one time.

Place the iron pot over an enclosed fire, either oil, gas or coal will answer. To treat the threaded pieces, melt sufficient cyanide to allow complete immersion of an iron basket of suitable size. Immerse the pieces contained in the iron basket and allow them to remain in the molten mass for approximately 10 minutes. Remove, shake vigorously and dump the contents of basket into clean, cold, running water. The result will be a clean thread, and a satisfactorily hardened metal, less work in polishing department, and freedom from useless labor and worry in plating room as well as ideal assembling conditions at the finish. The actual consumption of cyanide will be less than by present method which is very antiquated and the furnace repairs will be reduced 90 per cent.

* * *

Question.—During the summer months we experience considerable trouble in avoiding rusting of polished steel during the brief interval between the polishing operation and plating. The rusting is extremely bad during week-ends and much extra work is necessary to remove it. Can you assist us in preventing the continuance of this trouble?

Answer.—We would suggest the use of an oil dip by each polisher. A small can of lard oil or other non-corrosive vegetable or animal oil placed handy for the polisher who immerses the emery cake or tripoli in it prior to each application to the wheel, or use a rag saturated with the oil and apply to the wheel occasionally. This will produce an oily surface to the steel or iron, which will resist corrosion longer than the dry surfaces produced when only the polishing compounds are used. In some cases it is necessary to use slack lime on the hands when polishing steel or iron as a neutralizing medium for acid excretions from the hands of the operator, the result being decidedly more serious in warm weather and in factories where the ventilation is poor. We know of one large Canadian manufacturer who sprays all steel goods with coal oil immediately after polishing. This method entails extra labor in subsequent preparation of the goods for plating.

* * *

Question.—We wish a formula for a solution to clean buffing dirt from nickeled castings, either by simple boiling and swabbing or the electro-cleaning method. Ordinary cleaning solutions fail to soften the buffing compound left on the goods and we have been washing our nickel with gasoline, this we desire to avoid.

Answer.—A strong soap solution used with the electric current will effect a speedy removal of the buffing dirt. Whale oil soap is best for this purpose. 4 oz. per gallon of water made soft by addition of 4 oz. of soda ash per gallon will permit the cleansing to be done in from 30 seconds to 1 minute without tarnishing the nickel deposit. Use the solution at 212 degrees Fahr. and with full voltage of dynamo. A combination of Oakite No. 2 and Oakite plater's cleaner, 4 oz. of each per gallon will also remove the dirt very rapidly. Use same as the soap solution. Some operators claim to get greater efficiency from the Oakite combination by adding small quantities of whale oil soap to the solution occasionally.

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Question.—Would it be advisable to attempt to operate a nickel plating solution warm while contained in an asphaltum lined wooden tank?

Answer.—You may operate your nickel solution warm in an asphaltum lined wooden tank if you are careful not to allow temperature of the solution to rise above 80° Fahr. Tack a strip of wood on inside of tank about 2 or 3 inches below anodes, and at least 3 inches above the bottom of tank; to this strip tack another so as to form a shelf upon which to lay the lead pipe used for warming the solution. By placing the pipe in this position the slime which is present at the bottom of all nickel baths is not disturbed by the action of the steam pressure. Insulate the coil entering and leaving the tank. Heavy steam hose will suffice for this purpose if tightly clamped to the ends of pipe. If you place a false wooden lining in the tank, leaving room for expansion of wood, you may use temperatures ranging from 80° to 120° Fahr. without injury to either tank or goods being plated. A certain amount of "dead" or burnt asphalt may become loosened and float off on the solution, but this may be removed by skimming and will soon cease to appear. Many progressive platers are using ordinary wooden tanks for warm nickel solutions owing to difficulty in procuring the sheet lead lining at reasonable figure.

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Question.—In the manufacture of cast iron parts for munitions we have considerable difficulty from water stains on the copper deposits. Daily cleaning of the hot water tank has not proved very helpful. May we have your assistance in choosing an effective drying method for this particular purpose?

Answer.—Remove the coppered articles from the plating bath, rinse in cold running water and immerse in hot water containing about 4 oz. of neutral soap per gallon. Remove and quickly rinse in clean hot water and dry by means of compressed air blast. Then lacquer by use of spraying apparatus. Compressed air is the most satisfactory method of removing moisture from the small recesses of certain parts of munitions, etc.

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Question.—Our plating dynamo is a multipolar compound wound three-wire machine and we have copper and nickel baths connected to the two five-volt circuits, while the ten-volt circuit operates an electrolytic cleaning bath. Since using the ten-volt circuit more or less constantly we notice a serious drop in voltage over the entire system whenever the ten-volt circuit is in use. This condition naturally retards the speed of deposition in the plating tanks and in trying to remedy matters we tightened all drive belts, but with no beneficial results. The trouble is evidently in the machine. We would appreciate the advise of your correspondent regarding this question.

Answer.—As you do not state the capacity of your machine or the total current employed we must simply read between the lines of your letter for a general idea of your conditions. We therefore advise you to thoroughly clean the dynamo, remove and wash all brushes, inspect all connections of dynamo and external circuit. If commutator is rough, smooth it off with fine sandpaper. Replace brushes and use utmost care in proper adjustment of same. Lubricate the commutator with engine oil by applying the oil with a piece of felt or cheese cloth. Do not apply oil too freely, try the machine with full load and if all is well you may rest assured that cleanliness and proper lubrication of commutator are essential to the successful operation of the dynamo under maximum load. We are confident this will end the trouble.

* * *

Question.—Is nitre cake a Canadian product? What is its source and how is it used in commercial practice for pickling as a substitute for sulphuric acid?

Answer.—Nitre cake is crude acid sodium sulphate, and is a very variable substance. The free acid found therein may vary from 5 to 30 per cent. It is a by-product obtained in the manufacture of nitric acid and is produced in Canada in considerable quantities. Before the war the demands for this product were not sufficient to promote interest in the material. It is now used in the manufacture of paper and its use as a substitute for sulphuric acid in the pickling of metals is only of minor importance to the producers. It is used in aqueous solution at a temperature of 212° Fahr for pickling. Metal surfaces should be free from oils, greases, etc., to facilitate rapid action in pickling. It is of especial value in pickling annealed brass. The acid content should be maintained at from 3 to 5 per cent. by addition of fresh nitre cake. There is no gain in using a more highly concentrated solution. More rapid results are obtained by either agitating the solution or moving the metal undergoing treatment. The solution may be used with the electric current if desired, thereby effecting very rapid and thorough pickling at no extra expense excepting for power and in many shops this item would be negligible, as current from ordinary plating generator is all that is required.

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They can conquer who believe they can.—Emerson.

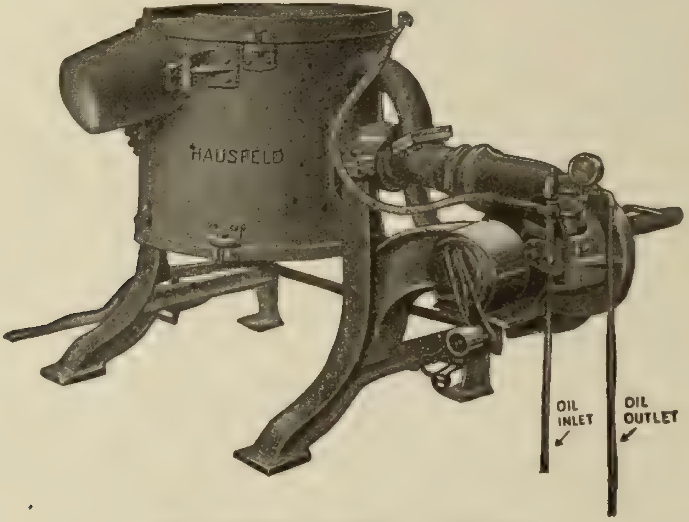
NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

NON-CRUCIBLE MELTING FURNACE

THE Hausfeld Company of Harrison, Ohio, is the manufacturer of the furnace herewith illustrated, which was designed particularly for the melting of brass and kindred materials. It is of the open-flame, non-crucible, tilting type and has a capacity of 400 pounds.

A "complete unit" consists of the furnace proper—lined ready for service—equipped with a Maxon Premix Burner, a one-half-horse-power motor (D. C. or A. C.), a patented fuel oil-feeder with burner and a pouring ladle, all as shown in illustration above. No equipment other than piping to the gas and the fuel oil reservoir is necessary. The furnace can be had without the fuel oil feeder and burner if desired, but for emergency purposes in event of failure of the gas supply the complete unit is almost essential.



NON-CRUCIBLE MELTING FURNACE.

One of the advantageous features of the complete unit is the facility and speed with which a change from gas to oil fuel can be made. As stated in a descriptive booklet of the furnace, a copy of which can be had upon request:

"The speed with which a change from gas to oil fuel, or vice versa, can be made may be best explained by the statement that a heat started and half finished by gas was finished by oil as the fuel in practically the same time had the change not been made." The change is accomplished by loosening two bolts, sliding the oil feeder housing forward, thereby placing the feeder into gear with the motor, tightening the bolts, removing the plug in the top of the elbow attached to the drum, and inserting the oil burner.

Although of compact form, occupying the minimum amount of space, the oil feeder develops a lift of over 18 feet, and has a delivery pressure of over 60 pounds. It is equipped with a relief valve capable of regulation, the outlet of which is piped to the oil reservoir, permitting the return of any excess quantity of oil.

The patented oil burner provides for heating the oil prior to its injection into the furnace. The location of the needle point seat being at the extreme end of the outlet causes a spray of wide range. To increase this range and break large particles of oil, a small division bar is located directly in front of the burner outlet. With this arrangement every drop of oil is satisfactorily utilized, and the oil being preheated and so finely atomized results in quick ignition.

As the flame, whether from gas or oil fuel, covers the entire inner surface of the furnace, a uniformly distributed heat is obtained and the metal is thereby melted largely by reflection of the heat from the walls, similarly to the effect obtained by melting in crucibles.

The plain shape of the drum facilitates relining. The bricks furnished have locking joints to prevent the seepage of metal. The manufacturers claim that both the brick and cement employed have excellent refractory qualities and withstand by far a greater number of heats than any other with which they have experimented.

Depending upon the character of the metal to be melted, from 9 to 12 heats can be obtained every 9 hours.

With the furnace drum in a vertical position, the furnace can be charged with gates and other scrap, while the blast is on, the metal being thrown on top of the drum where it preheats and then shoved into the charging hole, by means of a bar, as fast as desired.

The pouring ladle is located directly over the pouring hole where it remains during the melting of the entire heat. By this arrangement the ladle is heated to a temperature almost equal to that within the furnace and a separate preheating furnace is dispensed with. It also materially aids in retaining the heat within the furnace.

The furnace is tilted by means of a handle of a length sufficient to provide ample leverage for easy manipulation. The locking arrangement is spring actuated and tends to keep a bar on the frame in constant engagement with the teeth of a sector attached to the drum, securely holding the drum in any position desired. The release of the lock is effected by foot pressure on a treadle at the base, permitting the use of both hands for tilting or rocking the drum. For convenience, a double treadle is provided, one extending to the front and the other to the rear of the operating side, so that when tilting the treadle most convenient is used. Upon release of the foot pressure the drum is instantly locked.

The Hausfeld Company guarantee efficient and satisfactory results if the furnace is installed and operated in compliance with instructions furnished.

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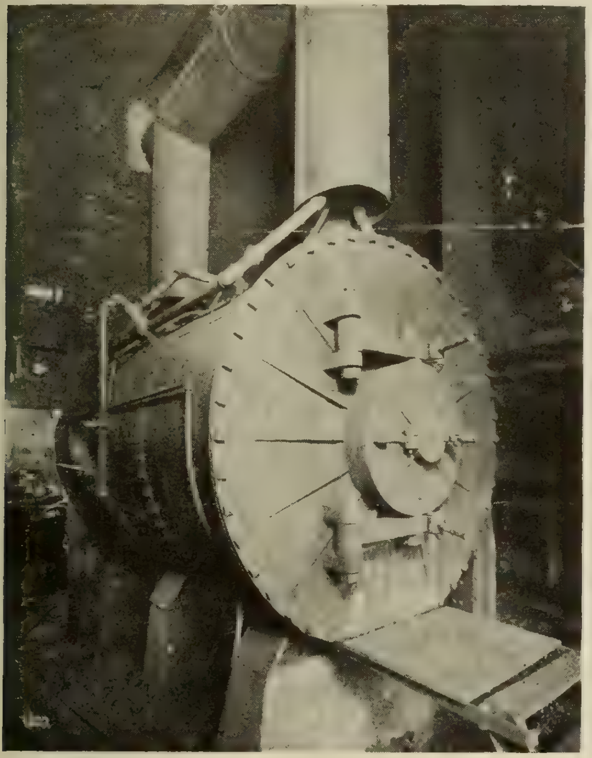
OIL BURNING REFINING FURNACE

A furnace which is adaptable to a wide range of uses in the refining of iron has been developed by Edward H. Schwartz, 436 Marquette Building, Chicago. At the plant of the Garden City Foundry Co., Chicago, the furnace is operated in connection with a cupola and the finished products are refined deoxidized semi-steel, refined deoxidized semi-malleable and gray iron.

In the installation shown the furnace receives iron direct from a 54-inch cupola, the spout from which enters the furnace at one side. Scrap is used almost entirely and often no pig iron is employed in the mixture.

In making the deoxidized semi-steel, steel scrap is charged in the cupola with a small percentage of spiegeleisen to aid in picking up carbon from the coke. This alloy also assists in deoxidizing and supplies manganese in addition to fixing some carbon. In order to supply the proper amount of silicon, ferrosilicon is added after the metal is transferred to the Schwartz furnace. There is a small refining loss of ferrosilicon which is taken into account in proportioning the mixture. Other alloys are added as desired to the charge in the furnace at the beginning of the refining process. An hour of refining is sufficient. A tensile strength of 50,000 pounds per square inch has been obtained in a bar machined from the center of the casting. Steel is produced by charging steel scrap with spiegeleisen in the cupola. Some of the sulphur is removed in the refining furnace by the formation of manganese sulphide. Additions of manganese and silicon are made at the end of the heat. Sulphur and phosphorus also are eliminated in the furnace by the addition of limestone to form a slag. Malleable iron is made by charging steel scrap and spiegel in the cupola with additions of silicon in the refining furnace in the form of ferrosilicon. Deoxidized semi-malleable refined iron is produced by charging malleable scrap and spiegel in the cupola. Silicon and alloys are added in the furnace during the refining process. It is said a tensile strength of 41,000 pounds has been obtained in an un-annealed machined bar. The metal may be hammered like malleable, has bending qualities and takes a high polish.



SCHWARTZ STATIONARY REVERBERATORY STEEL MELTING AND REFINING FURNACE

The refining operation in the furnace is relatively simple. The action of the flame cleanses the metal, removing the free carbon, oxides and occluded gases. The metal is heated until it is still and dead like crucible steel. Slag may be used to remove sulphur and phosphorus if they exist to too high a degree in the scrap.

The furnace is cylindrical with cast steel ends and steel plate walls. It is 6 feet 6 inches in diameter and 10 feet long, and is lined with firebrick to a thickness of 10½ inches. A removable bottom 4½ inches thick extends above the slag line. This bottom consists of chrome, silica or magnesite brick as neutral, acid or basic effects are desired.

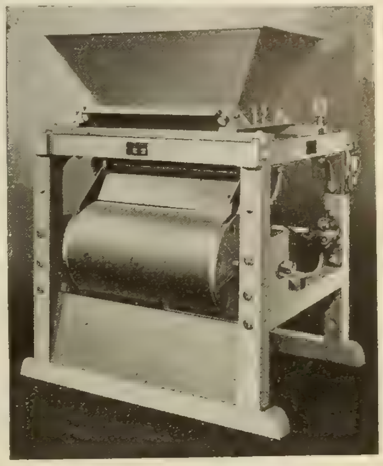
The charging door, in the center of one end, is circular. It is mounted on hinged arms and its machined face fits accurately, avoiding the necessity of clay luting. A smaller door in the center of the charging door covers a peep hole through which progress of the refining operation can be readily observed. This arrangement is clearly shown in the accompanying illustration. In the center of the end opposite the charging door an aperture is left for inserting a lighter to ignite the gas at the beginning of the process. This aperture is luted shut after the flame has been started. A testing door and slag hole are fitted on one side. Two vents are placed in the top, one near each end, with a vent hood and short stack. The waste heat from the furnace passing up these stacks preheats air passing down through pipes leading from the outer air to the gas burner. The current of air in these pipes is maintained by the vacuum action of the burner, which has 5 per cent. of compressed air supplied to it. The burners, it is said, are under absolute control by one valve. Three burners are placed in the top of furnace. One, in the apex of the arch, carries only preheated air. The other two are 45 degrees from the apex, in line with the first, and carry mixed gas and air. The currents from the three meet at the center of the furnace. It is claimed that temepratures of 5000 degrees Fahr. have been obtained.

A metal of uniform analysis for the manufacturer of shells is produced as semi-steel, with a tensile strength of 40,000 pounds. The furnace may be operated independently of a cupola, charging the cold scrap direct if desired, but this requires more time for melting and refining. The furnace at the Garden City plant is operated on gas from city mains. It contains about 500 b.t.u. per cubic foot. As stated about 5 per cent. of compressed air is employed, the remaining per cent of air being drawn in by the vacuum thus established. About 10 volumes of air to one of gas are delivered at the burner. Changes in supply of gas and air are controlled by one valve. Gas supply is reduced to obtain higher oxidizing action and the proportion of air is reduced to obtain a reducing effect. During the refining action the flame usually is maintained at the neutral point.

MAGNETIC SEPARATORS

THE Magnetic Mfg. Co., Milwaukee, Wis., are manufacturing a variety of magnetic separators for use in the foundry. One of the great advantages of using a machine of this nature is that the sand is left in a clean and uniform condition and may be used in various ways in the foundry. The machine is very simple to operate and does not require skilled labor to get the best results. It will not clog and will take care of any material that would be handled with a shovel, such as stray brick, gaggers and other coarse material usually found in foundry refuse. All parts are accessible for inspection without dismantling.

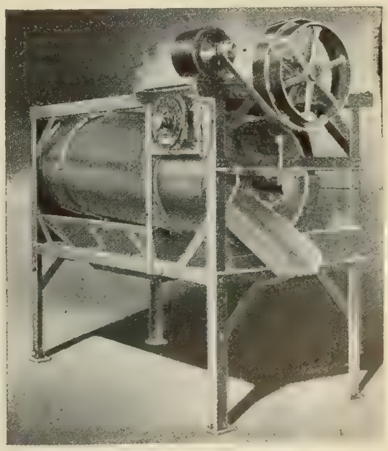
The material is shoveled into the machine at the upper end of a revolving screen. Sand and fine material passes through the screen into a hopper and may be caught into a wheelbarrow. The other material passes on through the cylinder and comes in contact with magnetized blades where the iron being attached to the blades is carried up to top of cylinder and then discharged into a chute.



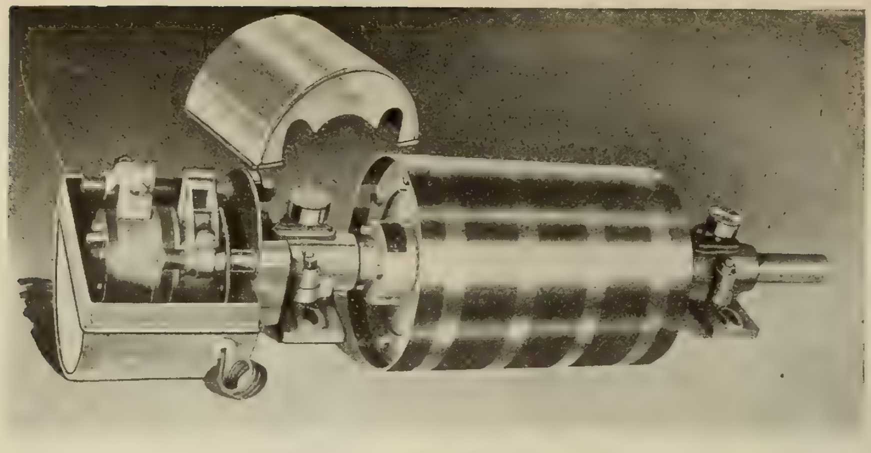
MAGNETIC SEPARATOR.

One of the commendable features in this separator is its simplicity. There are no friction wheels or level gears to wear out or give trouble. There are only four bearings on the machine. The two main bearings supporting the revolving cylinder are properly proportioned and are made dustproof. The only other bearings are the two small counter-shaft bearings located on the top.

Another product of this firm which is illustrated herewith is their magnetic pulleys. The use of magnetic rolls of head pulleys for belt conveyors is too well known to need much explaining. Threshing and grinding machines are using magnetic separation to remove stray pieces of iron and steel from the material being treated to prevent injury to the machine. On account of



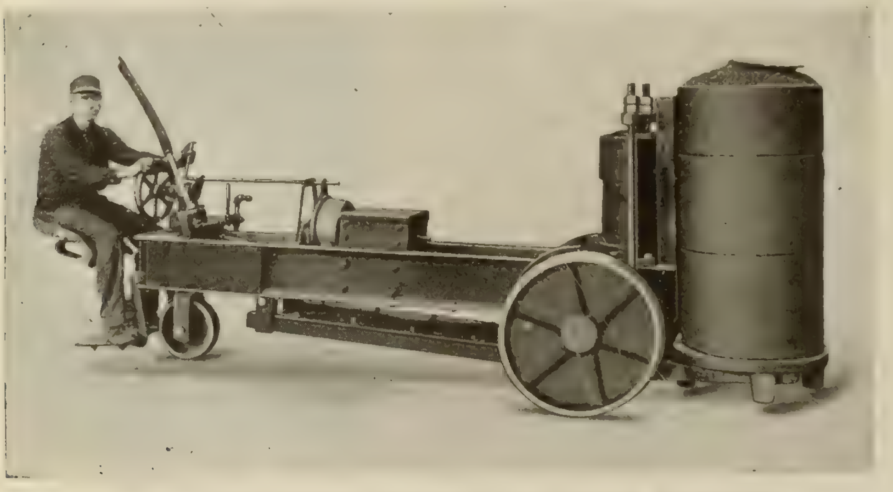
ANOTHER TYPE OF SEPARATOR.



MAGNETIC HEAD PULLEY FOR CONVEYORS.

the greatly increased use of steel and iron pieces of such metal, including small tools, find their way into almost every material transported or handled in large quantities, Magnetic separation is therefore an insurance against expense of breakdowns, exasperating delay, dulling grinders and fires started by sparks emanating from pieces of metal passing through the mill or other machinery. Such separation is often necessary for chemical and other reasons. Among the extensive users of magnetic pulleys can be mentioned coal, stone, gold, and garbage handling plants, the cleaning plants of various kinds, glassworks, foundries, etc.

These magnetic pulleys are furnished in various sizes and modified to meet installation requirements. They are always supplied with shafts and necessary electric parts and unless otherwise specified are furnished with pillow block bearings, grease cups, steel housing for the brushes and electrical parts. One of the pillow block bearings is made special and acts as a supporting member for the brush holders and the steel dust-proof housing for the contact rings and brushes.



NEW CHARGING TRUCK FOR MALLEABLE FOUNDRIES

A NEW CHARGING TRUCK FOR MALLEABLE FOUNDRIES

A new charging truck for malleable iron foundries has been developed by the Brown Specialty Machinery Company, Chicago.

The general construction of the truck as shown in the illustration is simple but very substantial. Two channel beams make up the main frame, from which is suspended the forged steel raising and lowering arms. These arms are equipped with removable cast steel tangs, easily replaceable when worn.

The arms are raised by an air cylinder, controlled from the operator's seat. A reversible air motor drives the truck through a set of reduction gears and a standard motor truck differential to pinions engaging in the internal gears on the driving wheels. Steering is by means of a standard motor truck steering worm, so arranged that the truck can turn in its own length.

The air hose is suspended from overhead, out of the way. Air consumption is only about 80 cubic feet per minute and the operating speed 90 to 120 feet per minute, so that the truck is well adapted for any malleable foundry.

◆

B. C. Will Export Manganese.—British Columbia will export 5,000 tons of manganese ore to the United States, under the permission of the Canadian Government. This ore will be used in the East, in plants now engaged in turning out munitions for the United States Government. It will be shipped from the Curle mine, near Kaslo, B.C. The limit set is 5,000 tons, though at the present moment that quantity is not available.

REDUCTION IN WRENCH STANDARDS

At a meeting of most of the drop-forged wrench manufacturers of the U.S.A., held at Buffalo, on August 7th, very material reductions of sizes, styles and finishes of drop-forged wrenches were agreed upon for the purpose of furthering the Government's conservation policy during the period of the war.

The drop-forged wrench makers have arranged to discontinue immediately the manufacture of regular finished wrenches which will release a great deal of polishing and lacquering labor, reduce the necessary bins by one-third and effect a very great conservation. Possibly the manufacture of the "Semi-finished" wrench, as such, may later be eliminated also; if so, there would be furnished in its stead a "War-finished" condition which would be its equal in efficiency but slightly different in appearance. It was further decided to purchase no more envelopes and no more boxes for packing except the few paper boxes necessary when furnishing wrenches in sets. All wooden boxes and all sample and display boards for advertising and sales purposes were eliminated.

The list of wrenches discontinued is as follows:

All so-called heavy cap screw wrenches, including all millings from those blanks.

All 22½ angle or textile wrenches, including all millings from that line of blanks.

All concave "S" wrenches.
All machine wrenches.
All long flat handle wrenches.
All double head socket wrenches.

All miscellaneous wrenches not mentioned in the next paragraph.

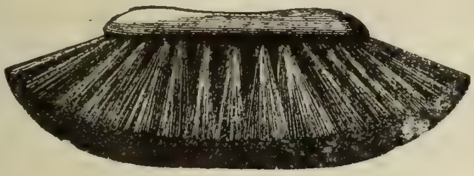
The lines retained as necessary are engineers' wrenches, chuck nut wrenches, light cap screw wrenches, hexagon box wrenches, square box wrenches, flat handle "S" wrenches, set screw wrenches, tool post wrenches, single head socket wrenches, spanner wrenches, construction wrenches, structural wrenches, round handle track wrenches, car wrenches and light service wrenches, all of which have useful functions to such an extent as to make their elimination doubtful from the viewpoint of conservation.

Until the exhaustion of the present stock, all orders received for regular "Finished" wrenches or for any of the above lines, will be filled as specified. Thereafter for discontinued lines there will be supplied wrenches of the nearest designs having the same openings and the "Semi-finished" condition will be supplied where regular "Finished" has been ordered.

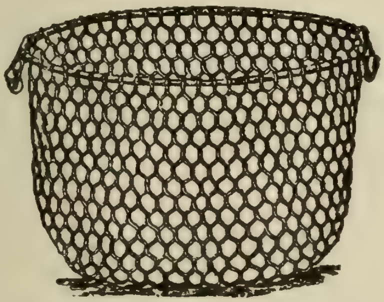
No action was taken on wrench sets as such, except, of course, those sets containing "discontinued" wrenches. "Discontinued" wrenches will not be furnished in sets or otherwise after the present stock is exhausted.

These Foundry Ladles are flat bottom riveted steel bowls with forged lips and vent holes.

Bench Rammers as illustrated are made from maple hardwood, thoroughly oiled, 13" long by 4½" diameter.



Moulders' Soft Brushes as above are made from the best quality pure Russian bristle, four inches in length, wire drawn. The block is in two pieces, glued and screwed together.



Coke or Charcoal Baskets of heavy woven galvanized steel wire are strong and durable.

MADE IN CANADA

at Headquarters for

Foundry Facings and Supplies

Exceptional facilities enable us to make quick deliveries from complete stocks.

Ceylon Plumbago No. 101

No better Facing used anywhere than this high-grade "Hamilton" product. Give it a trial.

Ceylon Plumbago No. 206

Used with unequalled success for General Machinery Castings. Put it to the test.

Use our Black Core Compound and you'll have a strong and lasting defence against core room troubles. It is 100% pure.

Special Stove Plate Facing has proved itself superior by a thousand actual tests.

Our Parting is always uniform in quality. It is giving complete satisfaction in many Canadian Foundries.

The Hamilton Facing Mill Co., Ltd.

Head Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger; base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	30 00
Copper, electrolytic	30 00
Copper, casting	30 00
Lead	10 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	100 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$20 00
Copper, crucible	24 50	24 50
Copper, heavy	24 50	24 50
Copper wire	24 50	25 00
No. 1 machine composition	22 00	22 50
New brass cuttings	16 00	15 00
No. 1 brass turnings	15 00	18 00
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	22 00
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	20 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	35 00	33 00
Malleable scrap	21 00	20 00
Pipe, wrought	22 00	17 00
Car wheels, iron	38 00	30 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	30 00	20 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	8 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.
B

¼ in.	$14 35
5-16 in.	13 85
⅜ in.	13 50
7-16 in.	12 90
½ in.	13 20
9-16 in.	13 20
⅝ in.	12 90
⅞ in.	12 90
1 inch	12 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 55
Solder, guaranteed	0 60
Babbitt metals	18 to 70
Soldering coppers, lb.	0 64
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	....	10 70
Premier, 10¾ oz.	....	11 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$13 00
3-16 in.	12 50
¼ in.	11 75
5-16 in.	11 40
⅜ in.	11 00
7-16 in.	10 60
½ in.	10 40
⅝ in.	10 00
¾ in.	9 90

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.58 to $0.65
Copper	.36 to .46
Tin	.70 to .70
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, hydrofluoric	.14½
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.22
Ammonium, carbonate	.33
Ammonium, chloride	.40
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.15
Caustic soda	.17
Copper, carbonate, anhy	.75
Arsenic, white	.27
Copper, sulphate	.22
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel sulphate	.35
Potassium carbonate	1.80
Silver nitrate ....(per oz.)	1.15
Sodium bisulphite	.30
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.50
Sodium cyanide, 98-100%	.38
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.85
Zinc chloride	.90
Zinc sulphate	.20

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 6- 9
Tripoli composition	06 to 9-10
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55
Crocus composition	08 to 8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 34
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

TORONTO.—Some Canadian dealers who have been at U. S. points do not bring back glowing reports of the chances of this country receiving increased supplies of raw material from United States points. The war program at Washington is staggering in its size, and compelling in the way in which the authorities are adhering to it. This program has precedence over all else, and it means that unless production is greatly increased the war appetite is going to crowd some of the less necessary business into the ditch.

Shell plants in Canada on American business are doing well in the matter of deliveries, although there are a number of places where operations are not yet under way.

Condition Is Not Hopeful

Those Canadian firms or houses that have been looking forward to something better in the way of supplies from U. S. points have been living in a false atmosphere. The plain fact is that the war program of United States increases

OUR NEW MONTREAL PLANT

THE DOMINION FOUNDRY SUPPLY CO. LIMITED.
THE DOMINION FOUNDRY SUPPLY CO. LIMITED
OFFICE 185 WELLINGTON ST.

We have recently built the above plant.

Over 25,000 square feet of floor space.

Have installed the latest machinery for the manufacture and handling of material.

Have Grand Trunk Ry. siding to our door.

And are in better position than ever to make prompt shipment of

"Everything You Need in Your Foundry"

The Dominion Foundry Supply Company, Limited

183 to 191 Wellington Street, Montreal

Toronto Warehouse: - - 142 Spadina Avenue every twenty-four hours. The war looks bigger to them every day, and they are expanding their war orders in proportions in keeping with this view.

Mr. Near, of Drummond-McCall, spent the greater part of last week at U. S. mills from which they have for years drawn a great share of their stock. "Things are looking worse than I ever anticipated," remarked Mr. Near to FOUNDRYMAN. It seems to make no difference whether an article is on embargo list on not, the government has its eye on it all the way through, and is determined to see that it goes to a war purpose shop and no place else. Previously Canadian warehouses have been getting sheets lower than 1-8″ quite readily, but it seems unlikely that this condition will continue for any length of time. The best rating that is given to warehouse orders is B-4. They give that rather than a direct turn-down. A B-4 rating depends entirely on your connection with the mills. As a matter of fact it is becoming a saying among the mill men when they are approached by the warehouse men, "I have an A-1 desire to serve you but only a B-4 ability." The arrangement as it stands at present gives the advantage entirely to the mills.

May Get Less In Future

"It looks as though there would be no increase in the allotment of material for this country. In fact, it really looks as though there might be a considerable cut in the volume of material for the Dominion. The sheet situation is causing not a little worry to a good many of the Canadian houses. There is a queer situation just at the moment. The big mills that can convert from sheets to plate have been ordered to do so by degrees. The first move was that 25 per cent. less billets should go to the sheet mills, that material being turned to the plate rollers. Now there has been notice sent out, and it will be operative in a few days from this, that another twenty-five per cent. shall be taken for the plate producers. The little mill that cannot turn over to anything but the rolling of sheets is left more alone, and to-day there is more money in the turning out of sheets than in the making of plate. That condition is not likely to run much longer, and it is these purely sheet mills that have been looking largely after the Canadian trade in that particular line.

The Vulture Is There

"There was one mill man in Pittsburgh," continued Mr. Near, "who gave me a pretty good outline of the demand for steel. He stated that there were jobbers hanging around there all the time in the hope that there would be a little over on the order of some firm that they might have a chance to buy. They also have the hope that there may be some half-spoiled material coming from the rollers that will not do for contract work. They hang around here for these pickings like a lot of vultures most of the time. Anything that is steel—that is about the extent of their specifications. He laughingly compared this to the specifications that the Canadians brought down, expecting to get them attended to at the mills at once. The Emergency Fleet board has a faculty of sending out specifications for a lot of work that has been very carefully worked out in advance and which requires an immense amount of care in the mills. There is generally a grand scramble to see if this particular order can't be loaded on to some other mill.

Have No Ruling

"As a matter of fact," concluded Mr. Near, "the Canadian warehouses have no ruling or standing at Washington. We are now, and have been for some time practically at the option of the mills as to whether we keep going or run out of stock. The trade is generally working into a narrower margin and I can't see anything that would make me believe that the situation is likely to be relieved in the near future."

THERE'S A BIG GAP UNFILLED IN THE AMERICAN SCRAP TRADE

THERE seems to be no let-up in the demand at U.S. points for scrap metals. Canadian yards on the other hand are well filled, and consumers here are being much better supplied with this material than those who are depending on U.S. markets. The embargo is still on in this country and Canadian yards are not allowed to ship certain grades to U.S. points. The situation in U.S. at the leading points is described in the following despatches—

Chicago.—A very large demand for heavy steel scrap is being received from Eastern points, but permits are not being issued for this material to leave this district.

New York.—Dealers here report that there is a very brisk demand practically for everything they have to sell, and on account of this, and also on account of the fact that very little material is coming out, prices remain firm at the Government maximum.

Pittsburgh.—There is no question but that users would absorb a very large amount of scrap over and above that which they are receiving were they able to secure it. The open hearth furnaces have benefitted to a very large extent by the embargo which has prohibited turnings from going to the blast furnaces.

Cleveland.—There is a good demand for heavy melting steel, turnings and low phos. are the scrap and iron and steel grades that are most wanted. There are numerous complaints being made over the car service, and deliveries on orders are rather indifferent on this account.

Cincinnati.—The price being paid now for labor in the scrap yards very seldom gets a chance to go below the 40 cents an hour mark. Some of the dealers here are inclined to be somewhat pessimistic about the future because the small dealers are not sending in anything like the amount of stuff that they have done in the past.

Philadelphia.—There has been some controversy going on here in regard to the standing of the scrap industry under the new draft regulations. Dealers however, are inclined to call attention to the ruling of General Crowder, in which he recognises the fact that the scrap industry was essential, and on this ground it is quite proper for dealers to claim exemption for any men they may have working in their yards.

Buffalo.—There is small chance of any of the dealers here accumulating any reserve stock against the winter months, when it will not be coming in as freely as it is now. All the tonnages that show up here are immediately absorbed by the trade.

Complaint is made that the high cost of labor leaves little incentive toward trading on the ground that since the Government prices were fixed there is little opportunity for the trade to make any money. There is a very keen demand for heavy melting steel, and in fact for any other heavy grades.

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NEW BOARD FORMED TO PREVENT STRIKES

Speaking at Toronto Exhibition on Labor Day, Premier Borden said in part:

"Not very long ago the great organizations of railway employees sanctioned and accepted a policy which has been embodied in an agreement made between the Canadian Railway War Board and the Railway Brotherhoods and Orders. The Canadian Board of Adjustment, thus constituted by formal agreement, comprised twelve members, six of them representing the Canadian Railway War Board (which acts for the railway companies of Canada), and six of them representing the various organizations of employees. The powers conferred upon this board will, I believe, enable it to redress all grievances and to adjust all differences promptly and satisfactorily. All need for strikes is avoided, transportation of food, munitions and supplies is not interfered with, the national effort is not weakened. The Canadian Board of Adjustment is to continue during the period of the present war, and thereafter until it is terminated by thirty days' notice on either side. I am confident that its results will be as great as its purpose, and will amply justify its continuance as a permanent arrangement.

◆

USING SALT TO GET MORE POTASH NOW

Before the annual meeting of the Society of Chemical Industry the Managing Director of the British Potash Company, Ltd., which is owned to a large extent by the Government, described the

YES, and not only a smile, but a *continuous* smile in which your entire organization will join you—for

DIAMOND GRIT
OR
CHILLED SHOT

makes you forget that there ever was such a thing as sandblasting troubles.

It eliminates dust—saves time—saves expense—saves storage space.

One bag of Diamond Grit or Chilled Shot will last as long and do more work than 100 bags of sand.

What it HAS Done:

(1) Six bags of Diamond Grit cleaned 2,000,000 pounds of brass castings.
(2) $67.20 covered the cost of cleaning 1,000 tons of malleable castings with Diamond Grit.
(3) In a New England foundry, one ton of malleable castings was cleaned at a cost of less than two cents.

We shall be glad to cite other interesting instances to you.

May we send you free samples?

HARRISON SUPPLY CO.
5 and 7 Dorchester Ave. Extension
BOSTON, MASS. U. S. A

attempts to increase the output of potash. Experiments were conducted in the blast furnaces of the North Lincolnshire Iron Company.

"The problems remaining to be solved," reports the Trade Commissioner, "are how to increase the potash content of these dusts by driving off the maximum amount of the potash contained in the raw materials fed into the furnace, and how to extract refined potash compounds from the dusts. After a long series of experiments, it has been found that the addition of a small quantity of salt to the charge of the blast furnace largely increased the amount of potash given off, without producing any deleterious effect upon the quality of the pig-iron produced.

"It is now estimated that by the use of salt, and by the installation of gas-cleaning plants, potassium chloride can be produced in quantity to meet all the requirements of the United Kingdom, of a purity above any yet reached in Germany, and, at a price which, on a pre-war basis of cost, is less than the lowest figure at which German chloride of potash has ever yet been placed on the British market, viz., £8 per ton.

"In the extraction of refined products from the raw materials, great progress has also been made. A factory has been erected, designed for a total output of 400 to 500 tons per week of potassium chloride from blast furnace dust, and there has been considerable increase in the manufacture of potash chemicals imported before the war. Now that initial difficulties have been overcome and better arrangements a marked improvement and considerable increases in production may be confidently expected."

TRADE GOSSIP

Hamilton, Ont.—The Ford-Smith Machine Co. has been granted a permit for the erection of a $30,000 factory.

North Vancouver, B.C.—Work on the $10,000 water main for the Wallace Shipbuilding Co. Ltd., is to be started at once.

Quebec, Que.—Fire recently destroyed the Quebec Railway, Light and Power Company's workshops at St. Anne de Beaupre.

Thorold, Ont.—It is understood that the Peerless Pump Company's plant, recently destroyed by fire, is to be rebuilt at a cost of $200,000.

Montreal, Que.—Williams and Wilson, Ltd., 320 St. James street, are erecting a $125,000 factory and office building. Architects, T. Pringle and Sons, Coristine Building.

Quebec.—A new concern know as the Eastern Machinery Co. will establish a factory here for building machinery. Amable Laprise of this city is interested in the new company.

Tribute to Smelters.—In the booklet issued by the Imperial Munitions Board, alluding to new war industries in Canada, comment is made on the establishment of the copper refining industry with the installation of a zinc plant by the Consolidated Mining & Smelting Company at Trail, B.C., at a cost of $2,500,000, with present capacity of metallic zinc, 18,000 tons; refined copper, 6,000 tons.

Coke Oven Machinery.—An 8-page bulletin is being distributed by the Wellman-Seaver-Morgan Co., Cleveland, which discusses labor-saving machinery used at by-product coke ovens. A combined coke pusher, coal leveler and door extractor and method of operation is fully described. Suspended and rail-type door lifters especially adapted for Koppers ovens are represented. The company has developed an improved design of coal charging cars. These late-type carriers are illustrated.

Tearing Down Factory.—A wrecking company has come into possession of the beet sugar factory at Wiarton, one of the concerns that was bonused to start there when that habit was at its height. Excellent buildings were put up and the plant was also regarded as a good one. The town has lost money liberally on the deal, and still has over $10,000 in debentures to settle. The present is the end of the plant, as the concern now taking it over is wrecking it to secure the structural steel that was used in the erection of the premises.

Niagara Falls.—The National Abrasive Co. have purchased twelve acres adjoining the Cyanamide Co., and have started active construction on their new plant. Five furnaces will be installed immediately and it is expected that this capacity will be doubled in the spring.

Incorporation has been granted the Ingersoll Machine Co. Limited to carry on the business of iron founders and manufacturers of machinery, ammunition and equipment of all kinds, tool makers, brass founders, metal workers, engine or boiler makers, etc. The capital stock is placed at $500,000 and the head office shall be in the city of Montreal.

The factory at the Falls wlll be approximately twice as large as that at Hamilton and will be modern and up-to-date in every respect. The expansion of this firm is due to the enormously increased demand for artificial abrasives.

Artificial corundum is rapidly replacing natural corundum, manufacturers being unable to import the natural product and the quality of the artificial corundum being found superior to that of the natural product for many purposes.

A COMEDY OF ERRORS

The Fire Marshal of the state of Wisconsin has issued a bulletin which he terms a "Comedy of Errors." It should have been called a tragedy. It says:

He looked for a gas leak with a match, and found it.

He lighted a match to see if his gasolene tank was empty. It was not.

He smoked while filling his auto tank, but will do so no more.

He smoked in bed; so did the bed clothes.

He threw the matches into the waste paper basket. He is wiser now.

He threw a cigarette stub into some rubbish.

He saved his oily waste and oily rags and they burned the shop.

He washed his hands in gasolene near the stove. The doctor washes them now.

He did not worry about fires as he had "plenty of insurance," and forgot the safety of his wife and children upstairs.

He stuffed up the chimney holes with paper and rags.

She cleaned her gloves with gasolene and saved fifteen cents, but paid the doctor and druggist fifteen dollars.

She poured kerosene into the lamp while the wick was burning.

She put gasolene into the wash boiler on the stove to make washing easier.

She dried clothes too near the stove.

She used the wrong oil can.

She burned sulphur all over the house to fumigate.

She used the wood-box back of the range as a waste paper receptacle.

She gave matches to her children to go out to burn leaves in the yard. The cotton dresses burned easier than the leaves.

She was "coming right back," so left the electric current on in her iron.

She swung the gas bracket too close to the curtains.

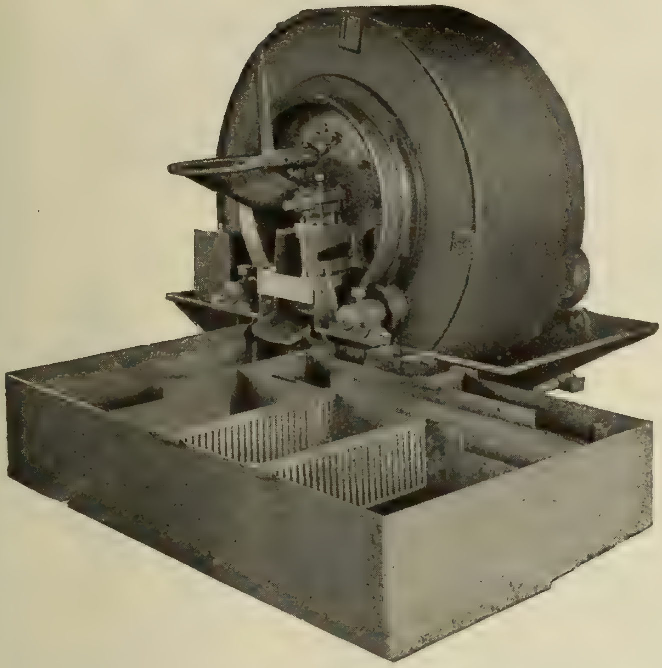
She fixed up a fine tissue paper shade for the lamp.

She filled the tank of her gasolene stove while one burner was going.

The comedies have turned to tragedies; many of the scenes of action were in ashes and too many of the actors are maimed or dead, more will follow, no doubt, as they are prone to ignore the advice and experience of others instead of profiting by their errors and sufferings.

The practical man probably has no greater enemy than some of the men of his own class who have risen from the ranks. A great many of these men through their petty jealousy and self-esteem make every effort to keep their fellow workers and employees ignorant of the very things they should know. Thus when new machinery is installed in a plant in charge of a man of this calibre, all the blueprints, bulletins, manufacturer's catalogs and other sources of information that should be available to the men who are operating the machine are confiscated by the man in charge with the narrow-minded idea of increasing his own knowledge and prestige over that of his fellows, or keeping the information from them so that they may not increase their knowledge above his. The management in most cases is ignorant of the real conditions that are going on, but in the eyes of the law "ignorance is no excuse," therefore in order to educate their employees, executives should become acquainted with conditions as they actually exist and introduce a practical and systematic form of instruction.—Industriaal Management.

Standard Mill



It reclaims all metal in cinders, slag, skimmings, old crucibles, etc. Built in four different sizes. Will crush and pulverize 600 to 6,000 lbs. **per hour** requiring 2½ to 7½ H.P. circulating same water over and over.

The Standard Mill is ready to operate as soon as you uncrate it. Pits under floor or special foundations are **not** needed. Lists of Canadian Foundries using it with great profit may be obtained for the asking. Write for Catalogue "C."

The Standard Equipment Company

Manufacturers of
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Classified Advertising

FOR SALE—100 MORGANS SALAMANDER Crucibles, for No. 400 Steel Harvey Furnace. The George Taylor Hardware, Ltd., Cobalt, Ont. (c11f)

FOR SALE—ONE MONARCH No. 275 TILTing Furnace, capacity 700 lbs. per heat. One Rockwell Type Tilting Furnace, capacity 5 to 700 lbs. per heat. One 5,000-gallon oil tank complete with motor operated pump, safety valves, etc. One No. 2 Root Pressure Blower, complete with pipe and fittings. Tolland Manufacturing Co., Limited, Montreal, Que.

FOR SALE

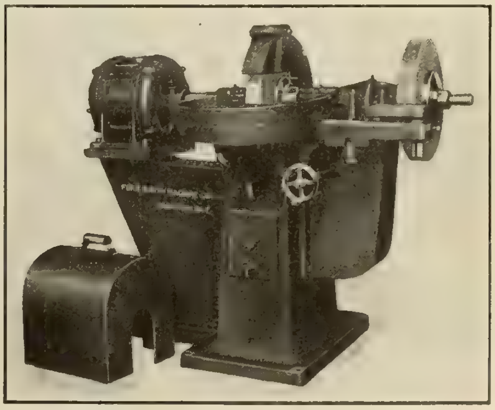
Two five-ton capacity ladles equipped for steel or grey iron, top or bottom pour, with bail pin gear; in excellent condition.

STANDARD MACHINERY & SUPPLY, LIMITED
Montreal, Que.

The Ford-Smith Machine Company

Motor Driven Dry Wheel or Water Tool Grinders

We manufacture a complete line of these machines, and to a customer in need of such equipment we can only say the proof is in the results, and we can show you results that will satisfy.



Write for Our Catalogue.

The Ford-Smith Machine Co., Limited
Hamilton, Ontario, Canada

Specialists in analyzing, mixing and melting of Semi-Steel, Grey and Malleable Irons.

The Toronto Testing Laboratory, Limited
160 Bay Street, Toronto

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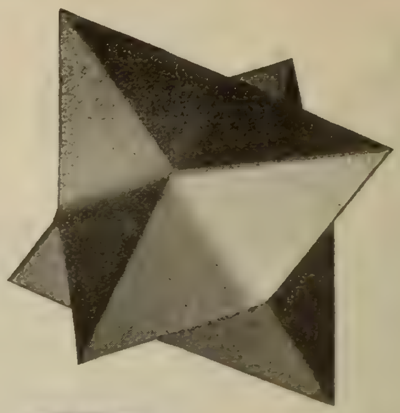
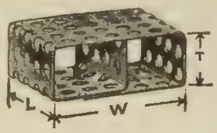
Durable and Effective Cleaners

Your inquiries always invited.





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CLEVELAND, OHIO

Mark Inquiries Dept. C.

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Special Quotations
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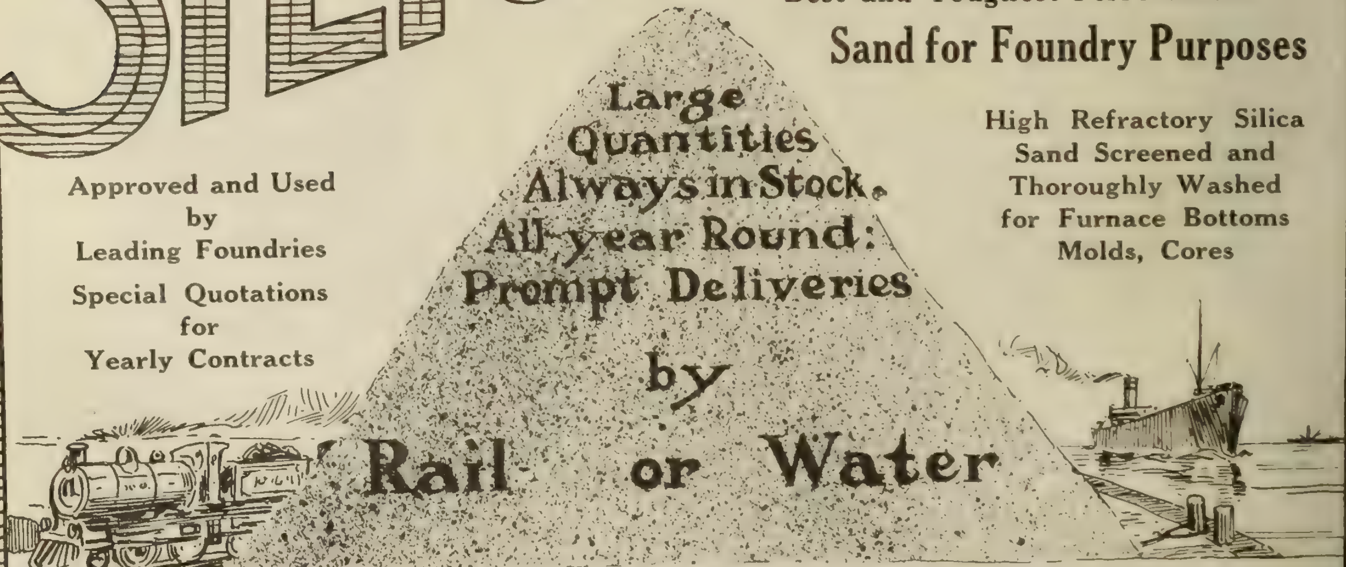

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Present conditions require that the FOUNDRY be well equipped—that every factor shal co-operate. The maximum amount of work depends on time and labor-saving machinery,

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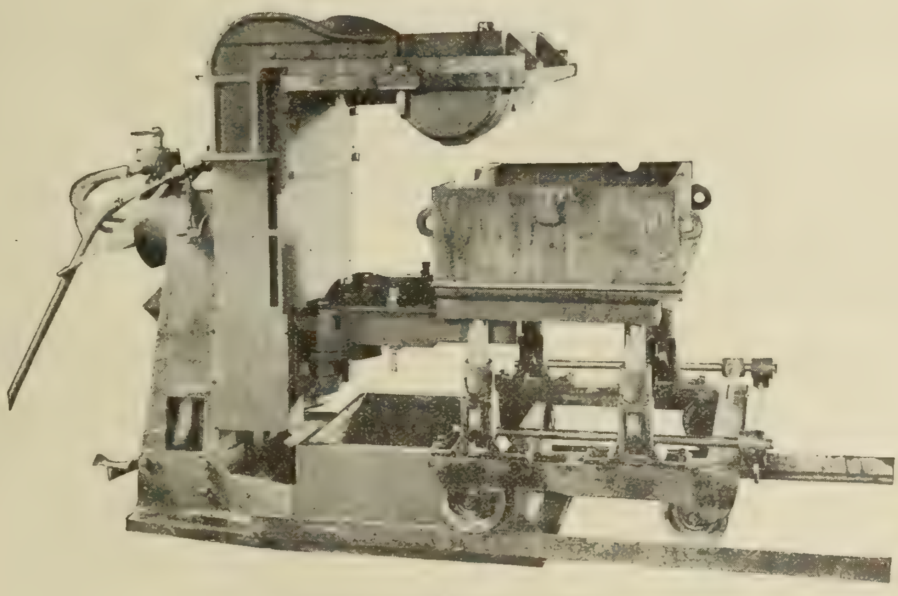

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After the mould is rolled over, the air is turned into the lower end of the cylinder and the pattern is drawn After the pattern is drawn the car raises the mold from the arms and takes it away from the machine. A vibrator is furnished with the machines. We make ¾", 1¾" and 2½" vibrators that vibrate and have a real kick.

LARGER SIZE Machines adapted to all kinds of war work—gun carriages, truck wheels, marine and aeroplane work.

Consult us about your Foundry Troubles. Let us talk it over at the convention.

GRIMES MOULDING MACHINE COMPANY

1218 HASTINGS STREET, DETROIT, MICH.

Took a Chair in Borden's Kitchen

AND stayed right there until he got his place in the Cabinet. Such, in brief, is the story of how one Minister got in, as told by J. K. Munro in the course of an article in September MACLEAN'S.

"A Close-Up of Union Government"

This article will be found distinctly interesting and refreshing, for it appraises the various members of the Government on their nine-months' spell impartially, fearlessly and humorously. Mr. Munro is a member of the press gallery, and he has watched the Cabinet members with a close and critical eye for nine months, and he knows their weaknesses as well as their greatness, and he chronicles their foibles unerringly. It makes good reading.

The September issue contains the following other features:

"Our Mary," the first of a splendid story of Mary Pickford.
By Arthur Stringer

"Buried Alive!" a gripping story of underground warfare.
By Lieut. C. W. Tilbrook

"Less Petty Politics, More Common-Sense," a fearless discussion of the war situation.
By Lieut.-Col. J. B. Maclean

Five splendid stories by well-known Canadian authors—Arthur Stringer, W. A. Fraser, Alan Sullivan, Archie P. McKishnie and Allen C. Shore.

The Events of a Warring World

The Review of Reviews section, made up of reprints from the best articles published the world over, contains an especially readable grist. Some of the articles are:

Lloyd George Founds New Secret Service.

Germany's Latest Plan to Enslave World.

Pretorius, Wonderful British Scout.

Is the Devil at Large?

Will Attack Holland Soon?

German Staff Live in Filth.

Germany Sought Peace in 1915.

Prophecies of the New Joan of Arc.

Ludendorff is Now Dictator.

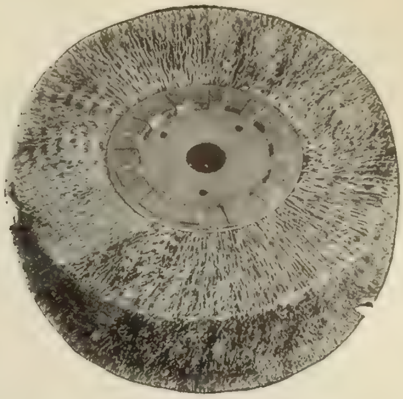
Will Labor Dominate Britain?

And a dozen more equally good

SEPTEMBER MACLEAN'S

Canada's National Magazine

At All News Stands - 20 Cents



SAMPSON

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A Brush Wheel that SAVES TIME, LABOR and outlasts any other make from 33 1/3 to 50%.

The above is a broad statement, but actual tests in some of the largest Foundries in the world have actually shown the "SAMPSON" wheel to do all that we claim for it.

A TRIAL order is all we ask of you, invoiced subject to your entire approval, and if you find our wheel does not save you money, yes, more money than any other wheel on the market to-day, your obligation ceases.

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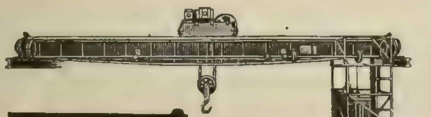

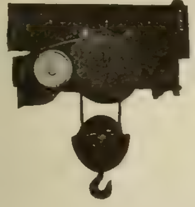

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TWELFTH AND CHESTNUT STREETS, CLEVELAND

American Foundrymen's Association

CHICAGO, September 9, 1918

To the Foundrymen of Canada:

For a number of years Canadian Foundrymen have taken an active interest in the annual conventions of the American Foundrymen's Association. In 1908 the Association accepted an invitation to hold their convention in the city of Toronto, and in 1909 one of your own foundrymen, Mr. L. L. Anthes, served as president of the Association.

This year it is to be hoped and expected that you will take an even greater interest, by reason of our being common allies in the great conflict that is now raging. We are pleased to make a brief statement as to plans and arrangements for the Milwaukee meeting.

The American Foundrymen's Association this year will have associated with it in convention the Metals Division of the American Institute of Mining Engineers (formerly the American Institute of Metals), the Iron and Steel Section of the American Institute of Mining Engineers, and the American Malleable Castings Association, making the occasion a great Allied Congress of Metals.

The program, preliminary copies of which have been mailed to all of the foundrymen of Canada, will deal largely with methods of manufacture in the production of ordnance, and you can contribute much out of your experience by attending and taking part in the discussions.

The exhibit of foundry equipment will be larger and more complete than any ever held in connection with these annual events, and the machine tool exhibit for the finishing of castings will be unusually good. In addition to the commercial exhibits we will have an interesting display of ordnance war material, arrangements for this having recently been authorized by Major-General Williams, Acting Chief of Ordnance, who has delegated an officer of his department to cooperate with us. This feature alone we believe will be well worth the trip to the Convention City.

Milwaukee is one of the greatest iron and steel centers in the middle west and is so prominently engaged in the manufacture of war materials that it has been called the Bridgeport of the west. The local committees on reception, entertainment, and shop visitation are most representative, and a cordial reception will be given to all who find it possible to attend.

As the Auditorium will be the centre of all activities no hotel headquarters have been nominated. This department will be pleased to furnish additional information as to hotel accommodations, etc., and we again say come; we welcome you.

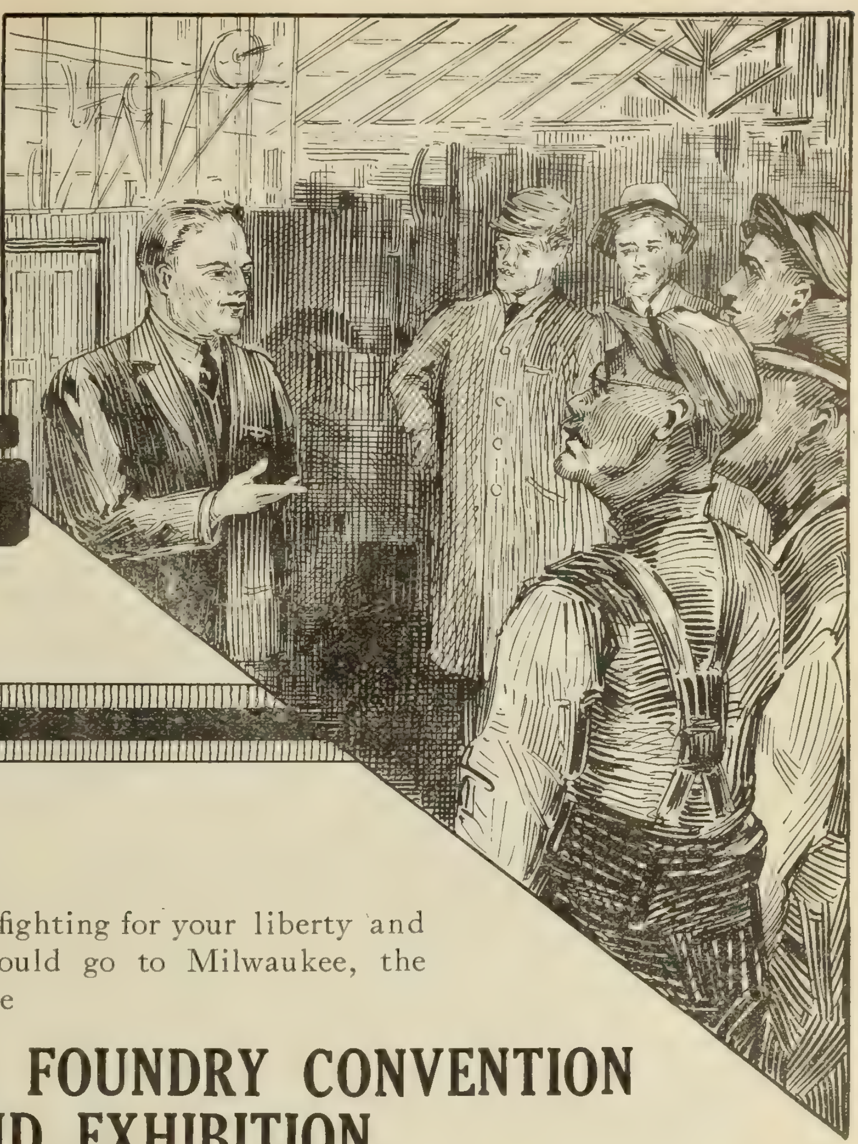
Yours very truly,

DEPARTMENT OF EXHIBITS

C. E. Hoyt

Manager

Let's Go, Boys!



OUR soldiers "over there" are fighting for your liberty and ours. For their sake we should go to Milwaukee, the week of October 7th and attend the

BIG ANNUAL FOUNDRY CONVENTION AND EXHIBITION

At Milwaukee we can talk things over with other big men in our line. We can find out just how other people are doing things quicker and better than we; and explain to them just how we are doing things better than they. Thus we can all become more valuable to ourselves, to our business and to our men who are giving their life's blood to maintain our freedom.

Following is just what is going to take place:—

The four leading technical and business associations representing the country's iron, steel and brass industries will meet simultaneously in Milwaukee, the week of October 7.

Concurrent with this Congress of metal-working trades, which includes the American Foundrymen's Association; the Iron and Steel Section of the American Institute of Mining Engineers; the Institute of Metals Division of the American Institue of Mining Engineers (formerly American Institute of Metals); and the American Malleable Castings Association, will be held a great exhibition of foundry equipment and supplies, machine tools and accessories and other metal-working devices.

Milwaukee
Week of
Oct. 7

This gathering will bring together the largest assemblage of iron, steel and brass foundrymen, iron and steel works managers, superintendents and engineers that ever met at one time anywhere in the world. It will be the first time that so many branches of the metal trades of the United States have ever gathered for simultaneous deliberation of the weighty problems that have been injected into their industries by the war.

COME AND SEE THE BIG EXHIBIT OF THE LATEST AND MOST IMPROVED MACHINERY, APPLIANCES, ETC., UNDER ACTUAL WORKING CONDITIONS.

For further information write.

The American Foundrymen's Association

DEPARTMENT OF EXHIBITS

C. E. Hoyt, Manager

1951 West Madison Street, Chicago, U.S.A.

Letting You Into A Secret

THEY were talking about things in general — Jones and Brown. But it was easily seen by Jones that Brown talked with a positiveness and definiteness lacking in himself. Brown evidently had real knowledge about things and this gave him an assurance lacking in Jones. Jones found himself talking in generalities, and he had the sense to know that what he had to say wasn't very convincing. In the end he spoke up. "Brown, tell me, where do you get your information? You talk like one who knows. You use facts to fortify your opinions, and you seem to have a wealth of information about things Canadian. What's the secret of your greater confidence and knowledge?"

And Brown said: "I'll tell you, Jones, how I have strengthened myself in confidence and knowledge, as you put it. I read my newspaper in a new way now, and I make it a point to know a good deal about Canada, the land of my birth, residence and affection.

"For years—until I was forty—I read newspapers, as many others do—pretty thoroughly. I read about accidents, and meetings and fires, and everything else. One day I woke up,—was awakening up, to tell the truth—to discover that I was just frittering away time when I read everything.—Then I determined to concentrate my interest on matters Canadian—the things about Canada that really matter.

"I wanted direction. I needed a focal point, as it were. What should be skipped, and what should be read closely? I was floundering. I am not much of a politician, and I abominate party politics. I wanted to see things fairly.

"Then one day I made the acquaintance of THE FINANCIAL POST. It seemed to me to give me the direction I needed. I found it was sifting things for me, and giving current affairs their right proportioning. At any rate, it was a new kind of newspaper to me, and I read it with zest.

"I am a business man, and business in its larger aspects is the special field of THE FINANCIAL POST. I found the paper written in a readable way, and that it has a breadth of interest pleasing to me. So I subscribed for THE POST, and every Saturday and over the week-end this paper is pretty thoroughly ready by me.

"I find that the reading of this paper helps me get out of my daily newspaper the meat in it. As a matter of fact, I read my daily newspaper and other papers with a new and informed interest which makes my reading a profitable thing.

"I read somewhere that an hour a day spent on any subject would make a man master of that subject in 10 years. Well, I do not know that I am seeking to be a master of Canadian affairs, but I do know that for the past two years or so I have been having a new joy in life. I am really trying to know my Canada.

"I clip a good deal, and my scrap-book on Canada is a treasure house for me, I collate the material I put in that book, and whenever I want to read up any particular subject, I have before me, gathered up, a surprising amount of material obtained from many sources.

"I take luncheon at the Club daily. There are eight of us who gather daily at the same table. One is a wholesaler, another is a banker, another a publisher, another a manufacturer, another a manufacturers' agent—and so on. We have a representative gathering.

"We talk about many things, and about Canada most of all. I take great satisfaction from the knowledge that I am able to hold up my end of the conversation. To tell you the truth, it is this reputation that spurs me on to keep myself brushed up all the time. I own up, also, to practising a little subtlety. I guide the conversation in the direction of a subject that I am well informed on, and then I bide my time, letting others wrestle with it until they have told all they know. Then is my chance, and I am able to say something useful to a company that is attentive.

"Jones, if you want to improve the quality of your information, read purposefully, objectively. Cut out the reading of everything under the sun. You are a business man, the same as I am. Why not read definitely along the line of business? You will find it a most pleasurable kind of reading, and you'll find that you will acquire the sifting mind which will enable you to pass over a lot of stuff of no value to you, and seize on material of real value.

"I recommend THE FINANCIAL POST as a paper that will give your reading direction. It has helped me much, and I believe will help you. At any rate, it is easy to try it out."

IF JONES wants to try out THE FINANCIAL POST he can have it go to him by mail for four months for a dollar bill. One thing that ought to impress and please Jones is that THE POST is not a one-man paper. It is produced by many men, each a surpassingly well-informed man on the subject he writes. One man writes on matters pertaining to agriculture, another on the iron and steel industry, another on the food problems and milling and cereal subjects, another on insurance, another on textiles, and so on. The special contributed articles which are a regular feature of THE POST are by authorities or by men of position. Besides which, THE POST surveys many fields of interest, and this survey is world-wide. It is a meatful paper, in very truth, and assures those who read it regularly an amount, kind and quality of reading not commonly found in a single newspaper. If you would make your daily reading take on a new interest and value, we suggest that you should sign and forward the coupon opposite.

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Send me THE FINANCIAL POST for

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I will remit on receipt of bill in the usual way.

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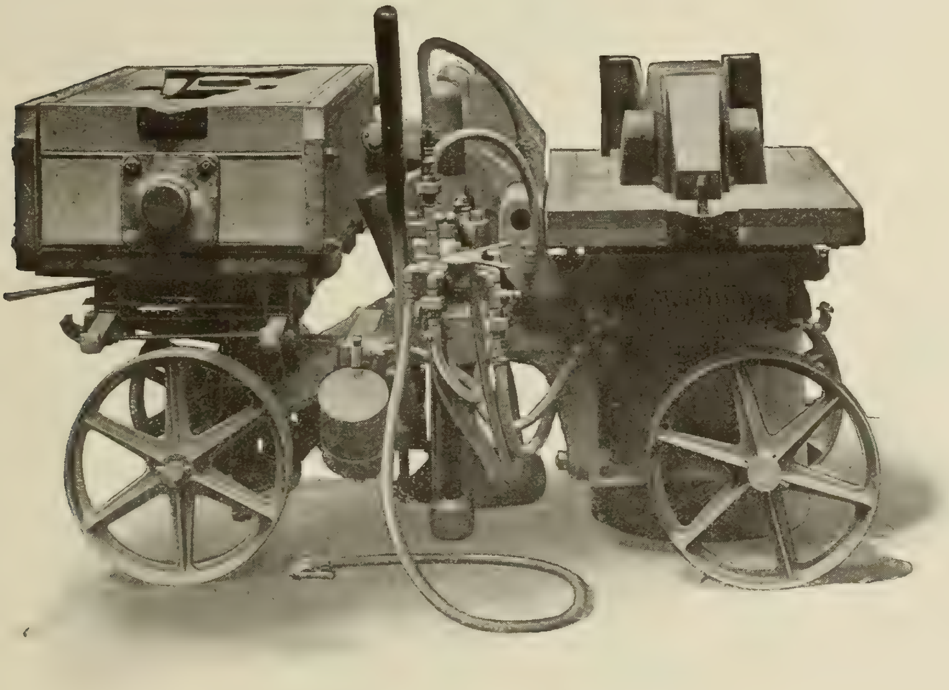
TABOR

Portable Combination Shockless Jarring Roll-Over and Pattern Drawing

Moulding Machine



This machine is a combination of TWO DISTINCTIVE TABOR FEATURES, *the shockless Jarring Machine and the Roll-Over Straight Draft Molding Machine.* Saves all ramming and finishing time and is suited to a wide variety of work.

The machine shown is of 18″ Nominal Size, provided with 8″ Straight Pattern Draft, and will handle flasks 18″ wide, 36″ long and 12″ deep, weighing not in excess of 450 pounds, with 80 lbs. air pressure.

Send for free copy of Bulletin M.S.H.

The Tabor Manufacturing Company, Philadelphia, Pa., U.S.A.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

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Can. Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

AIR COMPRESSORS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Hyde & Sons, Ltd., Montreal, Que.
Sullivan Machy. Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

ANALYSIS
Hersey Co., Ltd., Milton, Montreal, Que.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BARROWS, FOUNDRY
Sterling Wheelbarrow Co., Milwaukee, Wis.

BOILERS
Rodgers Boiler & Burner Co., Muskegon, Mich.

BOILER GRAPHITE
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

BLOWERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

BLAST GAUGES—CUPOLA
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BOXES (Tote)
Sterling Wheelbarrow Co., Milwaukee, Wis.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRICKS, RUBBING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRIQUETTING
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

BRUSHES, FOUNDRY AND CORE
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUCKETS, GRAB
Pawling & Harnischfeger, Milwaukee, Wis.

BUFFING AND POLISHING MACHINERY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CARBON BLACKING
Hyde & Sons, Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

CAR MOTORS
Can. Ingersoll-Rand Co., Montreal, Que.

CARS, CORE OVEN AND FOUNDRY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, ETC.
United Brass & Lead, Ltd., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
United Brass & Lead, Ltd., Toronto, Ont.
W. W. Wells, Toronto.

CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.
Federal Malleable Co., West Allis, Wis.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Fanner Mfg. Co., Cleveland, Ohio.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Standard Equipment Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.

CLAMPS, FLASK
Obermayer Co., S., Chicago, Ill.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

CLOTHING, ASBESTOS
Halcombe Safety Garment Co., Chicago, Ill.
Wheeler Mfg. Co., F. H., Chicago, Ill.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., T[illegible]
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Brown Specialty Machy. Co., Chicago, Ill.
Wm. Demmler & Bros., Kewanee, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE PLATES, STEEL
Peck Iron & Steel Works, Kalamazoo, Mich.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.

CRANES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Pawling & Harnischfeger, Milwaukee, Wis.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

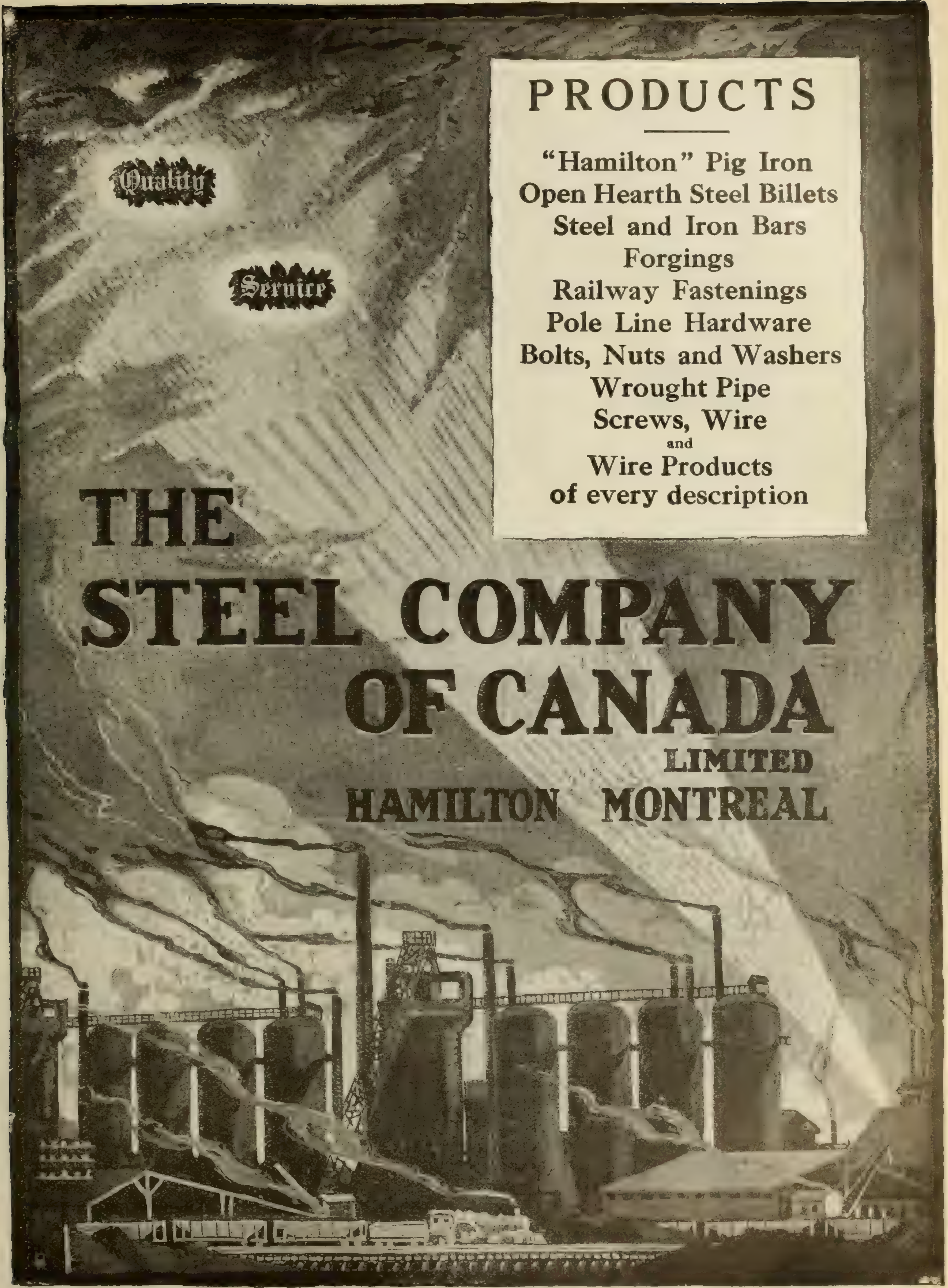
CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DYNAMOS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.



PRODUCTS

"Hamilton" Pig Iron
Open Hearth Steel Billets
Steel and Iron Bars
Forgings
Railway Fastenings
Pole Line Hardware
Bolts, Nuts and Washers
Wrought Pipe
Screws, Wire
and
Wire Products
of every description

THE STEEL COMPANY OF CANADA
LIMITED
HAMILTON MONTREAL

DUST ARRESTERS AND EXHAUSTERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.

ELECTRO PLATING
United Brass & Lead, Ltd., Toronto, Ont.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

FACINGS
Obermayer & Co., S., Chicago, Ill.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FIRE BRICK AND CLAY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE CEMENT
Stoldler, W. F., 218 S. Geddes St., Syracuse, N.Y.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FLASKS, PRESSED STEEL
Peck Iron & Steel Works, Kalamazoo, Mich.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOOT PROTECTORS
Holcombe Safety Garment Co., Chicago, Ill.
Wheeler Mfg. Co., F. H., Chicago, Ill.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY EQUIPMENT (new and second-hand)
Scully-Jones Co., Chicago, Ill.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY SUPPLIES
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Schwartz, Edward H., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Walker & Sons, Metal Products, Hiram, Walkerville, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

GLOVES AND MITTS, ASBESTOS
Holcombe Safety Garment Co., Chicago, Ill.
Wheeler Mfg. Co., F. H., Chicago, Ill.

GOGGLES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Ingersoll-Rand Co., Montreal, Que.

GRINDERS, DISC, BENCH, SWING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

GRINDERS, RESIN
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRIT, ANGULAR
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Can. Ingersoll-Rand Co., Montreal, Que.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

HELMETS, ASBESTOS
Holcombe Safety Garment Co., Chicago, Ill.
Wheeler Mfg. Co., F. H., Chicago, Ill.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hansen & Van Winkle Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Pawling & Harnischfeger, Milwaukee, Wis.

HOISTS, HAND, TROLLEY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Scully Jones Co., Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Toronto, Ont.

INGOTS, BRIQUET
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

INGOTS, COPPER, BRASS, BRONZE AND NICKEL
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

IRON CEMENTS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.

IRON FILLER
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

LADLE HANDLES, STEEL
Peck Iron & Steel Works, Kalamazoo, Mich.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

LIMESTONE, CALCIUM
Thorold Planing Mills, Thorold, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.

LOADING SKIPS, STEEL
Peck Iron & Steel Works, Kalamazoo, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Charles C. Kawin Co., Toronto.
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MINING AND QUARRYING MACHINERY
Sullivan Machy. Co., Chicago, Ill.
Blystone Mfg Co., Cambridge Springs, Pa.
Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MOLDERS, LEGGINGS
Holcombe Safety Garment Co., Chicago, Ill.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Cooper Saddlery Hardware Co., H. W., Moline, Ill.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Federal Malleable Co., West Allis, Wis.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

NOZZLES, SAND BLAST
Stoldler, W. F., 218 S. Geddes St., Syracuse, N.Y.

NICKEL, CHROME
Walker & Sons, Metal Products, Hiram, Walkerville, Ont.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PANS, WET AND DRY
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PATTERN SHOP EQUIPMENT.
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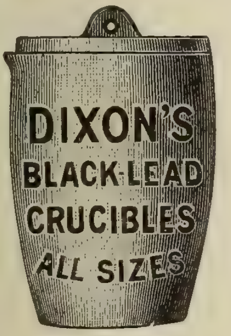
ALBANY MOULDING SANDS

WE CAN MAKE SHIPMENT TO ALL POINTS

Agents for Stowe-Fuller Co.
High Grade
Firebrick, Silica Brick, Fireclays

FOR FOUNDRY SUPPLIES, SEE CLASSIFIED LIST IN "BUYERS' DIRECTORY"

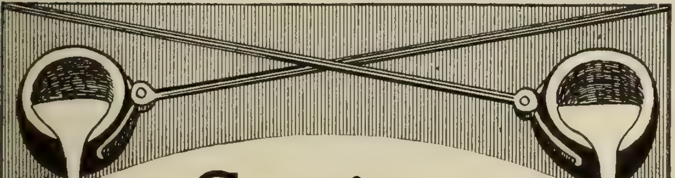
HYDE & SONS, MONTREAL



When you think of a crucible think of DIXON and remember that the Dixon name stands for the longest and widest experience in the crucible industry.

Write for Booklet No. 27-A.

Made in Jersey City, N.J., by the
JOSEPH DIXON
CRUCIBLE COMPANY
Established 1827



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Brass, Gunmetal, Manganese Bronze, Delta Metal, Nickel Alloys, Aluminum, etc.

MARINE AND LOCOMOTIVE ENGINE BEARINGS. MACHINE WORK AND ELECTRO PLATING. METAL PATTERN MAKING.

United Brass & Lead, Ltd., Toronto, Ont.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel** for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers of Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

Experts Agree on Hoskins Pyrometers For Foundry Use

Extracts from an article by Alfred Herbert, Ltd., in the August issue of the CANADIAN FOUNDRYMAN:

"Previous to the adoption of the HOSKINS' alloys nickel-nickel chromium, there was no practical thermo-couple which could be inserted unprotected by a sheath in these metals. The alloying effect was so great that the thermo-couple was destroyed after a few readings."

"Usually in foundry work the time lag of the sheath is an objection, and fortunately in such cases the HOSKINS' alloy thermo-couple provides a solution of the problem."

"After the fused junction between the two alloys has been destroyed by the molten metal the metal itself forms a junction so that this use of the pyrometer can be continued without making a new junction."

"HOSKINS' alloys are of the order of fifty times as great as those of the high-resistance platinum alloy pyrometer. The gain in robustness and suitability for industrial work will be obvious."

Write for complete catalogue.

Made In Canada By

Hiram Walker & Sons Metal Products Limited
Walkerville, Ontario

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Fire Brick and Cupola Block Headquarters

Fire Brick are not to be bought as you would buy Eggs or Oats.

To economically and successfully use them they must first be bought with knowledge of their QUALITIES as well as with knowledge of their REQUIREMENTS when in actual service.

Every brand of Fire Brick is thus made for a SPECIFIC PURPOSE.

One brand, for boiler settings, for hand-fired horizontal boilers, which resists 2,000 degrees Fahrenheit and which must resist also the abrasion wear of the slicing-bar of the fireman when he knocks off clinkers. When the wrong kind is used not only the clinker but the brick too are destroyed—there is needless expense.

Another kind, for heat-treating furnace lining where high degrees of heat prevail.

Still another kind for cupola linings, which must resist not only heat but abrasion wear of the charge as it wears down through the melting process.

So it goes; each for its purpose. This is not an intelligence office but intelligence is used in supplying the right Fire Brick for the right purpose.

I have the brands that have made Fire Brick history.

I carry these brands IN STOCK. Note the advantages: Every Brick reaches the user with clean, straight edges, uninjured, and every one is thus adaptable to a straight line of masonry in the brick wall. Again, many Fire Brick manufacturers are several months behind orders. I can accept your order IMMEDIATELY and deliver with reasonable promptness.

There is no duty on ordinary Fire Brick. I can ship Fire Brick, Cupola Blocks and Fire Clay in carlots or less. Write stating the service required.

FREDERIC B. STEVENS

Manufacturer of Foundry and Electro-Plating Supplies and Equipment.

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WAREHOUSE and OFFICE
Cor. of Larned and
Third St.

FACING MILL
Cor. of Isabella Ave. and
Mich. Central Railroad.

EXPORT WAREHOUSE
Windsor, Ont.

EASTERN SELLING AGENTS
Standard Machinery & Supplies, Ltd.
Montreal, Quebec.

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Coralox is the highest grade abrasive known.

Coralox is made from pure Corundum electrically heat treated.

Coralox is not alone harder than any natural abrasive, but of a distinctive "temper" rendering it peculiarly adaptable to polishing all metals.

We carry large stock of Coralox in warehouse, Toronto, and are prepared to make prompt deliveries from this point.

If you are not already using Coralox, write us for sample to-day.

CANADIAN HANSON & VAN WINKLE CO., LTD.

TORONTO, CANADA

VOLUME IX. No. 9 CONVENTION NUMBER OCTOBER, 1918

CANADIAN FOUNDRYMAN
and
Metal Industry News

PUBLICATION OFFICE, TORONTO,

And "Flint Shot" is *helping*
by *speeding up* Shell Output.

FLINT SHOT is rapidly superseding all other Sand Blast Abrasives in Canadian Shell-Making Plants because it *cleans by wholesale* and makes a better job of it.

UNITED STATES SILICA COMPANY
SOLE PRODUCERS OF FLINT SHOT
1939 Peoples Gas Bldg., Chicago, Illinois, U.S.A.

KAWIN SERVICE

POINTS THE WAY

The Proper Mixture—How to Make It

Correct Cupola Practice—Uniform Castings

Solve Moulding Troubles—Reducing Losses

Increase Output—Reducing Man Hours of Labor

NOTE: Are you going to the Milwaukee Convention? Call at our booth and get acquainted with our men and methods.

Chas. C. Kawin Company
LIMITED

Chemists — Foundry Engineers — Metallurgists

307 Kent Bldg., Toronto, Can.
94 Dunn Bldg., Buffalo, N.Y.
Dayton, Ohio
Chicago, Ill.
San Francisco, Cal.

LET US SELL YOU A

DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it —you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES
don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

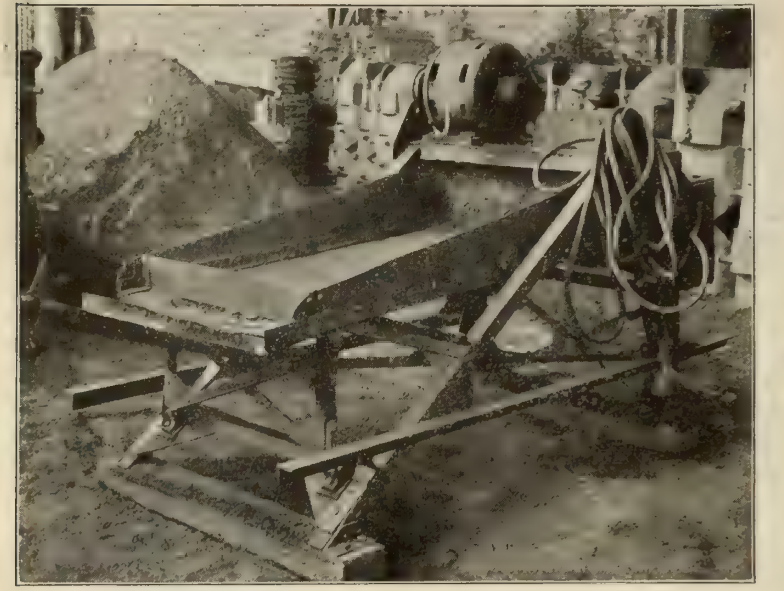
THE E. J. WOODISON COMPANY, TORONTO

Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont.

Rodgers Electric Sand Riddle

Canadian Foundrymen Need this Labor-Saving Machine

Rodgers Electric Sand Riddle has been specially designed to **save labor and save time**—it is not made merely to sell. It has been adopted by some of America's largest foundries. With it they are meeting the labor shortage problem and cutting the cost of production. You can do likewise.



The price of the Rogers Electric Sand Riddle is moderate, and it soon pays for itself. The machine, complete with motor and belt is $400 f.o.b. cars, shop, Muskegon, Mich. Furnished with or without motor. If purchaser furnishes own motor a deduction of $100 is made. Good and efficient work is done with a 1½ H.P. motor.

You can't afford to be without this labor-saver and cost-cutter in times like these. It's an investment which quickly pays big returns. Let us tell you more about it.

Rodgers Boiler & Burner Company
Muskegon, Michigan

TABOR

3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY
18th and Hamilton Sts. Philadelphia, U.S.A

The Manager of a big car wheel foundry said—

"One of our competitors asked me with regard to your core sand mixer and I told him I was surprised and ashamed of myself to think that we could run a car wheel works for so many years without a sand mixer. And on the strength of what I told him he purchased one of your mixers and is very much satisfied with it."

Mr. H. G. Brown,
Brown Car Wheel Works,
Buffalo, N.Y.

—and why he said it.

He said it because the Blystone Core Sand Mixer produced such revolutionary economies in his foundry.

The *Blystone* reduces the time and the labor cost of mixing 50% to 60% as compared with hand mixing.

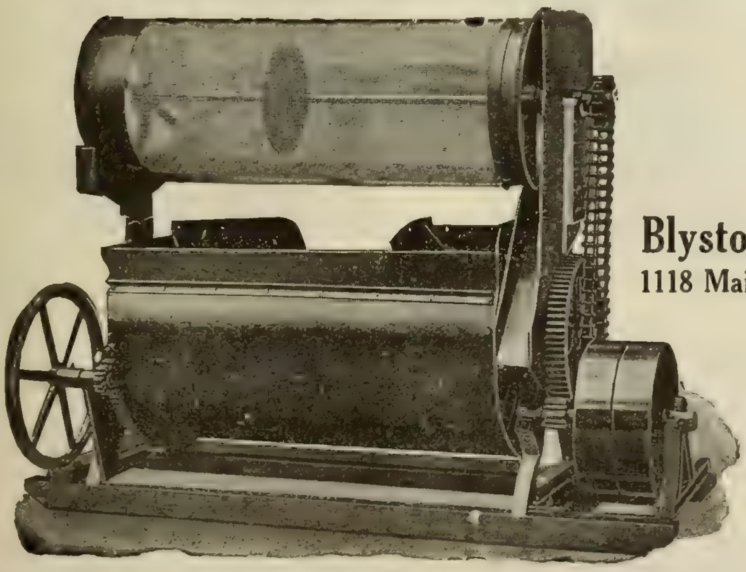
The *Blystone* Mix is so thorough that 10% to 20% less binder is required.

The *Blystone* Mix is so absolutely uniform and complete that defective cores are almost entirely eliminated and castings are smoother.

The *Blystone* will enable you to turn out the same volume of business with fewer men or a larger volume with your present force.

For these reasons Mr. Brown, and the executives and workmen of more than a thousand other American foundries, say the Blystone is "indispensable" equipment—especially in times like these.

The Blystone will prove indispensable in *your* foundry—so sure are we that we will guarantee it to do so.



Wire or write.
Prompt delivery assured.

Blystone Manufacturing Company
1118 Main St. Cambridge Springs, Pa.

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Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

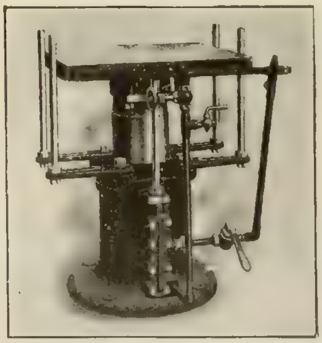
Catalogue on request

A TRIAL WILL CONVINCE YOU.

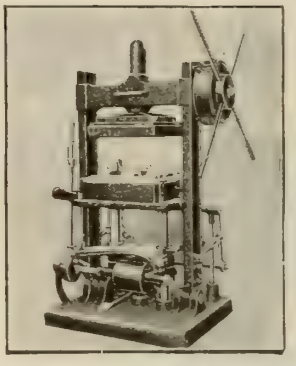
Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

British Moulding Machines

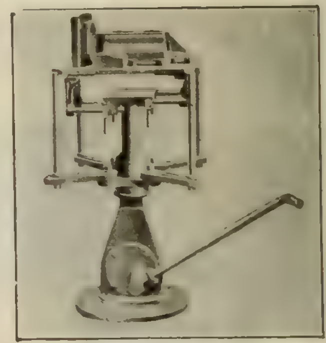
AND FOUNDRY EQUIPMENT



The JARR RAM (Pneumatic).
The Machine with a Perfect Lift.



The HEAD RAM.
Most powerful Hand Machine made.



The HAND RAM.
Adjustable to any size box.

The most efficient Machines, built to stand rough usage

Write for Catalogue to

BRITANNIA FOUNDRY COMPANY
COVENTRY, ENGLAND

Smash the Kaiser

Let Us Convert Your Copper Shell-Band Turnings Into

BRIQUET-INGOTS
(TRADE-MARK)
99.9% Pure Copper

WE conserve COPPER by returning to you BRIQUET-INGOTS that are practically as solid and as pure as virgin ingots, and can be used in place of new metal or heavy melting scrap.

Not ordinary briquets, mind you, but **solid** Briquet-Ingots made by patented processes and machinery that remove all iron, oil, moisture and other impurities; and **weld** the turnings into a solid mass, by a combination of pressure and shock.

THIS process has established a place for itself in the industrial world by saving and briquetting

A HUNDRED MILLION POUNDS

of brass chips—and now we extend the same boon to the producers of **copper** turnings.

Our conversion fee is but a small fraction of the values we save.

Send for full information

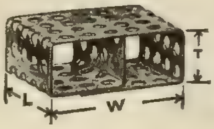
Metal Block Corporation

208 So. La Salle Street
Chicago, Ill.

CHAPLETS

of every description

Perforated, Forged, Riveted and Electric Welded



HARD IRON TUMBLING STARS

Made of a Special Grade of Iron for the Tumbling Barrels.

We take care of you

The Fanner Mfg. Company
CLEVELAND, OHIO
Mark Inquiries Dept. C.

To-day When-High Grade Castings Are Desired And In Demand

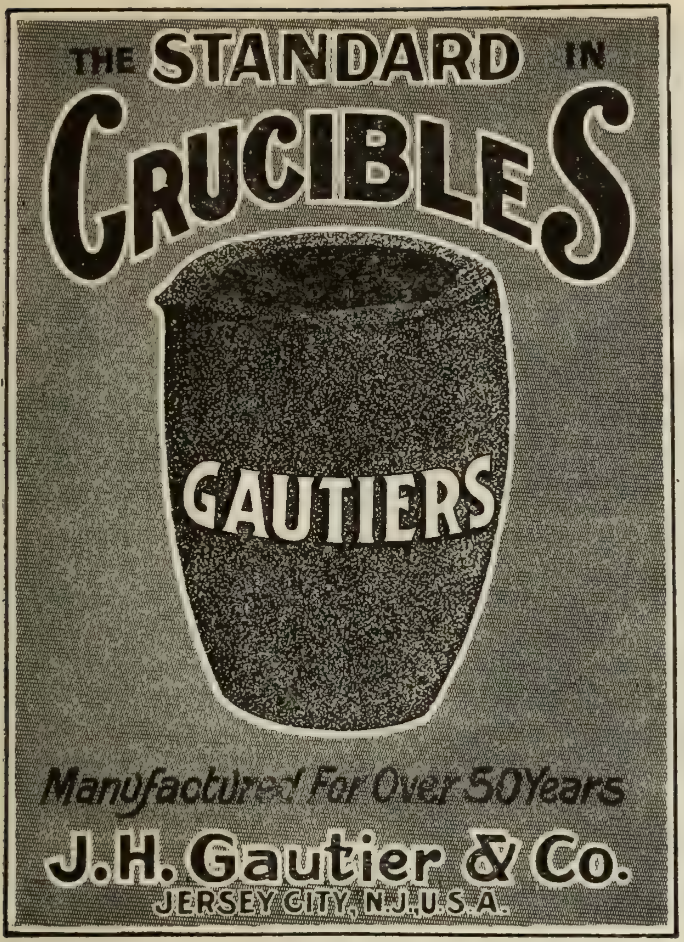
You should use the very best material which will guarantee results and prove the cheapest in the end.

Our No. 522 Plumbago	**Stevens' Carbon Dry-Sand Blacking**
No. 510 Plumbago	**and King Kore Kompound**

have our guarantee back of them and we are willing to ship a barrel for trial, from our Montreal stock.

We also carry a full line of other FOUNDRY SUPPLIES AND BUFFING AND PLATERS SUPPLIES.

Standard Machinery & Supplies Limited
260 St. James St. **Montreal, Que.**



THE STANDARD IN
CRUCIBLES
GAUTIERS
Manufactured For Over 50 Years
J. H. Gautier & Co.
JERSEY CITY, N.J., U.S.A.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel for the purpose.**

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

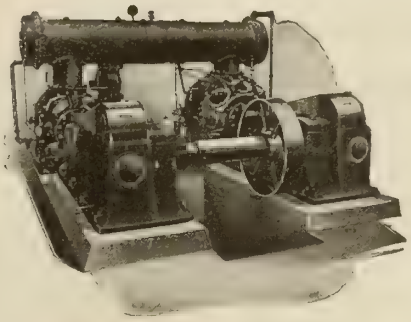
Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers of Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

DEPENDABLE

Compressors
Air Hoists
Sand Rammers
Chippers
Grinders

With Can. Ingersoll-Rand equipment you are sure of a steady, sure supply of compressed air and reliable tools, simple in construction, easy to operate, dust proof, and economical to run.



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Toronto, Ont.
Cobalt, Ont.

Timmins, Ont.
Winnipeg, Man.
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Vancouver, B.C.
New York, N.Y.

ABOVE ALL COMPETITION

DINGS

DINGS MAGNETIC SEPARATOR CO.
MILWAUKEE, WISCONSIN.

Over 2,500 Now in Operation

The Publisher's Page

TORONTO OCTOBER, 1918

The American Foundrymen Convention

MILWAUKEE, OCTOBER 7th-11th

THE Convention held by the American Foundrymen's Association and other Allied Metals Associations, October 7th to 11th in Milwaukee, was a big success in every way. The attendance was larger than last year; the interest, if anything, was keener. Things ran with the utmost smoothness despite the fact that Uncle Sam is working overtime—one foot in America and the other in Europe.

The exhibition of Foundry Equipment and Supplies held in the great Auditorium was the most complete thing of its kind ever staged. Nearly 200 exhibits were shown. Many were animated and were shown as nearly as possible under actual working conditions.

There was a record attendance from Canada and a Canadian, Mr. Jansen, Superintendent of the Canadian Steel Foundries, was elected Vice-President of The American Foundrymen's Association for 1918-1919. An interesting innovation as far as Canadians were concerned was furnished by CANADIAN FOUNDRYMAN, badges being supplied to all Canadians registering at the booth occupied by this publication. The badges identified Canadians as Canadians, and as the placing of our booth at the disposal of Canadians and the supplying of badges was so much appreciated and taken advantage of, the service will be continued and developed next year.

The superintendents, foremen and owners who attended the convention from Canada came back greatly benefited, wiser and more efficient. More Canadians should attend. It broadens. It brings new ideas. We all get rusty and a visit to the Convention annually rumbles and tumbles and sandblasts the rust off and sends us home brighter, keener and better.

In the advertising section following will be found the advertisements of many of the leading exhibitors. To visit the Exhibition, to examine the equipment at first hand, is well worth while. The next best thing is to study the advertisements. Keep this issue of CANADIAN FOUNDRYMAN by you for reference. Reference to the Convention and a full list of Exhibitors will be found in the Editorial Section. We have tried to bring the Convention home to those who could not attend.

Cleveland AIR TOOLS

CLEVELAND FOUNDRY TOOLS AND SUPPLIES

SAND RAMMERS

are light in weight. Have high speed. No vibration or recoil in operation. Well liked by piece-workers for above reasons. Made in five sizes.

CHIPPING HAMMERS

are speedy tools. Dust-proof and are always on the job. The low cost of up-keep makes them desirable and profitable in foundry work.

PORTABLE EMERY GRINDERS

Made in two sizes—Nos. A & AA, with 3,300 and 2,700 R.P.M., adapted for Grinding Grey Iron or Steel Castings, or for any general work as required.

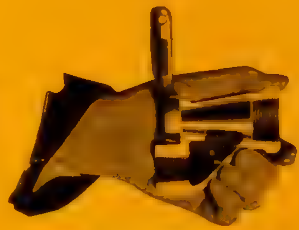
WE MANUFACTURE—

Riveting Hammers, Calking and Beading Hammers, Air Drills, Corner Drills, Valve Grinders, Core Breakers, Etc.

CLECO
Air-Seated Valve

Always Tight **Never Leaks**

Has but three parts—Body, Plug and Handle. No packing required as Valve-Plug is "Air-Seated." No Angle turns in Air Channel as in other makes of valves.



Accompanying Sectional Cut shows interior of valve and its extreme simplicity. All Foundry Pipe Lines should for "Economy" be equipped with Cleco Valves.

F. O.

The Cleco Valve is made in two styles as illustrated. The style P.O. is made in sizes 1¼-in. Pipe Thread Inlet and 1-in. Pipe Thread Outlet; 1-in. Pipe Thread Inlet and ¾-in. Pipe Thread Outlet; ¾-in. Pipe Thread Inlet and ½-in. Pipe Thread Outlet. The style F.O. is made with 1-in. Pipe Thread Inlet and Female Bowes Coupling Outlet.

P. O.

BOWES AIR HOSE COUPLINGS

Over 1,500,000 in General Use

The Bowes is instantly connected or disconnected and air-tight in all pressures.

The Bowes Coupling is interchangeable. Sizes ¼-inch to ¾-inch inclusive.

Above cut shows Cleco Never Slip Clamps attached to Bowes.

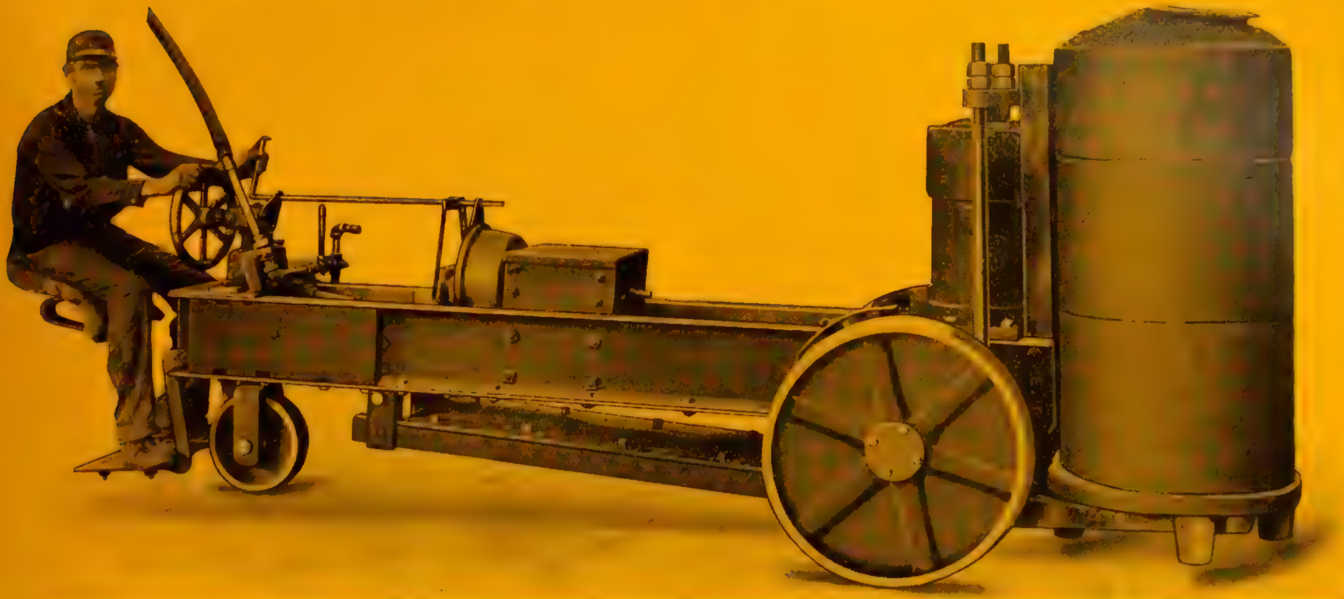
Write for Bulletins Nos. 35, 37, 38, 39.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 Chestnut Street, Toronto

Agents: A. R. WILLIAMS MACHINERY CO., TORONTO WILLIAMS & WILSON, MONTREAL

A NEW CHARGING TRUCK FOR MALLEABLE FOUNDRIES



After complete and thorough tests of every kind—tests that would put an ordinary truck on the scrap heap—this new air-operated charging truck is now ready for the hardest service you can give it.

The main frame is made of two channel beams. The forged steel raising and lowering arms are equipped with removable cast steel tangs, easily replaceable when worn. The air cylinder for raising annealing pots is controlled by a valve near the operator's seat. A reversible air motor drives through a set of reduction gears and a standard auto truck differential to pinions engaging the internal gears on the under side of the wheel flanges. Steering is by means of a standard auto truck steering worm, arranged so that it can turn in its own length.

Very low air consumption. Simple air mechanism. Sturdy construction. Easy steering. Economical operation. Minimum maintenance cost. Maximum service.

A Big Success at the Milwaukee Show

Brown Specialty Machinery Co.
2528 W. 48th Place
Chicago

Write for Complete Information

BROWN

Holcomb Asbestos Mitten
Lined or unlined

Holcomb Safety Garments

Hurry the completion of good work by eliminating many of the common accidents to workmen. They are made specially for the protection of employees who handle molten metal, heated articles or acids.

Holcomb Asbestos Glove
Lined or unlined

Holcomb Asbestos Long Mitten
Lined or unlined

Holcomb Molders' Spring Knee Legging—on or off in an instant.

Canadian foundrymen at the Milwaukee Convention evinced interest in the Holcomb "Safety First" exhibit. Whether you attended or not—
Write to-day for Catalog.

HOLCOMB SAFETY GARMENT CO.
14 SOUTH JEFFERSON ST., CHICAGO, ILL.

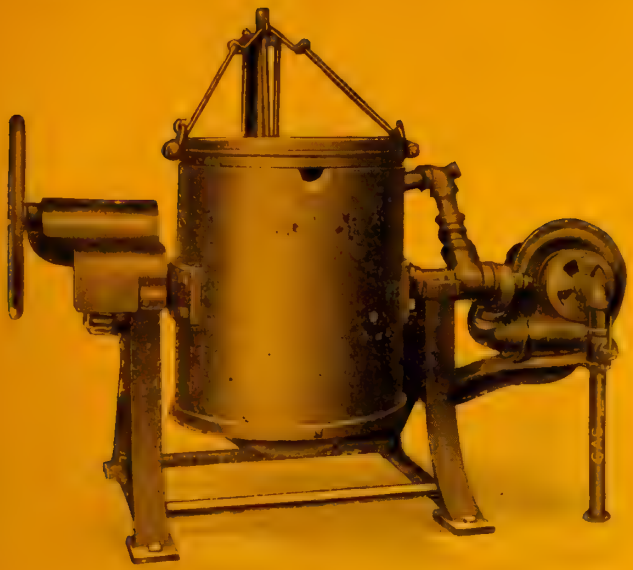
This PECK Slip Jacket "B"

Is the Lightest Guaranteed Jacket Made

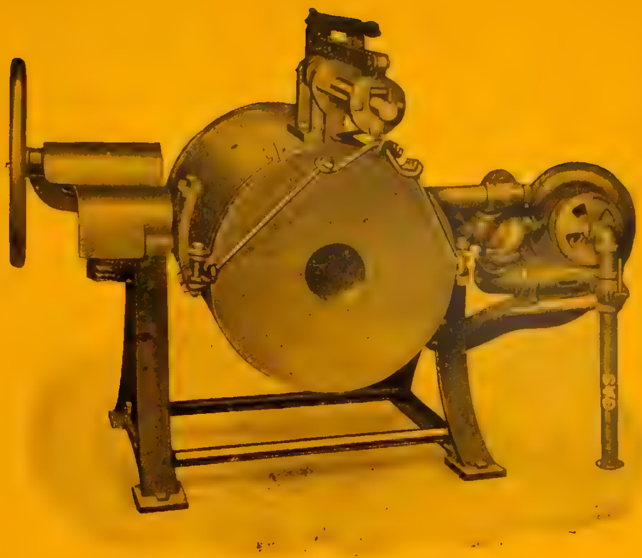
Steel; sides straight or taper; corners acetylene welded and therefore greater in strength than the original metal.

Ask for Foundry Equipment Catalog S. It helps to make foundry work profitable.

PECK IRON AND STEEL WORKS
KALAMAZOO, MICH.

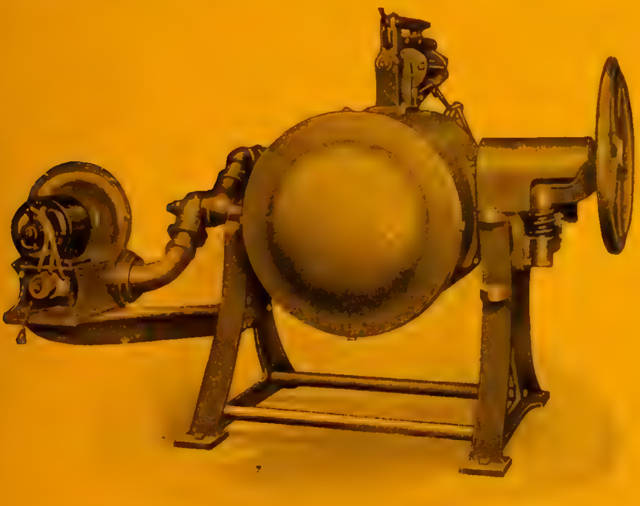


Front view of furnace equipped with Premix Motor Blower for Gas Fuel.



Front view, furnace tilted for pouring. The worm gear tilting mechanism holds furnace safely at any angle.

Rear view showing Premix Motor Blower and cover-lifting and swinging device. The gas or oil burns and melting proceeds continuously whether furnace is upright or tilted.



Rear view, furnace tilted for pouring, showing round bottom. Inside bottom corners are rounded, which eliminates loss from metal adhering to lining in corners and preventing the pouring of full contents.

New Monarch Melting Furnace

YOU are well acquainted with our Horizontal Simplex type of melting furnace. Here is a recent and successful development of it.

The MONARCH VERTICAL NON-CRUCIBLE TILTING METAL MELTING FURNACE is designed to fill in where a small quick melt in a non-crucible furnace is desired.

Equipped with Premix Motor Blower for Oil or Gas Fuel.

Melts Brass, Copper, Monel-Metal, Nickel, Aluminum, Bronze, Gold, Silver and any ordinary foundry mixture.

The NEW MONARCH VERTICAL NON-CRUCIBLE TILTING MELTING FURNACE is a proven economical success. Our reputation built up over a long period of years and upheld by thousands of Monarch furnaces in daily operation in the largest Canadian and United States plants stands behind it.

Examine illustrations closely, and write for circular explaining the new Monarch in all its details.

The Monarch Engineering & Manufacturing Company

1206 American Bldg., Baltimore, Md., U.S.A.
Shops: Curtis Bay, Md.

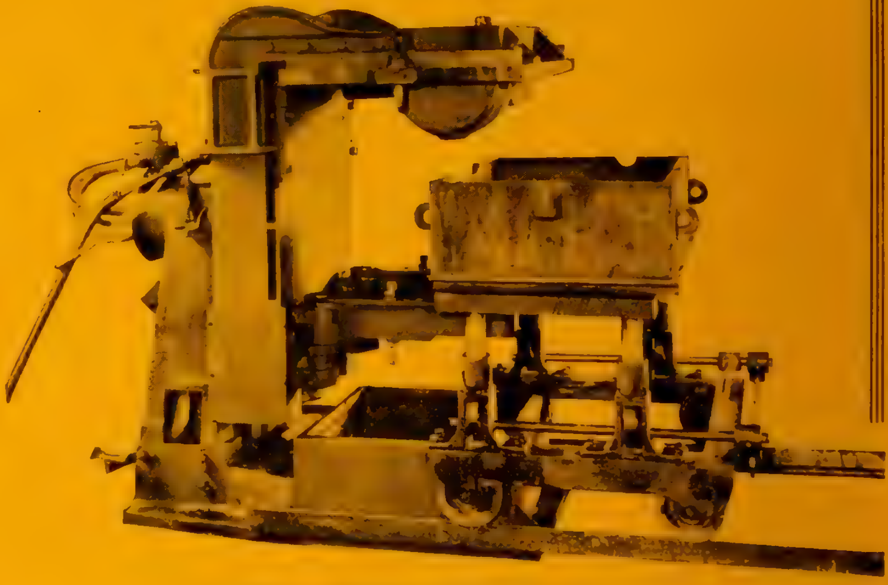
GRIMES

Jolt Rammed Rollover Molding Machines

BEST FOR WAR WORK

Present Conditions
Require New Methods

Scarcity of Labor
Automatically
Forces All Foundries
to Machine Molding



No. H614---1000 Pounds Lifting Capacity

Buy the Best

All Round Power Machine on the Market

ARE NOW MAKING

Shells, Truck Wheels, Crank Cases, Oilpans,
Piston Rings
Ship Building and Ordnance Work

Write us your problem. Our Engineers may help you.

GRIMES MOLDING MACHINE CO.

1218 Hastings Street
DETROIT, Michigan

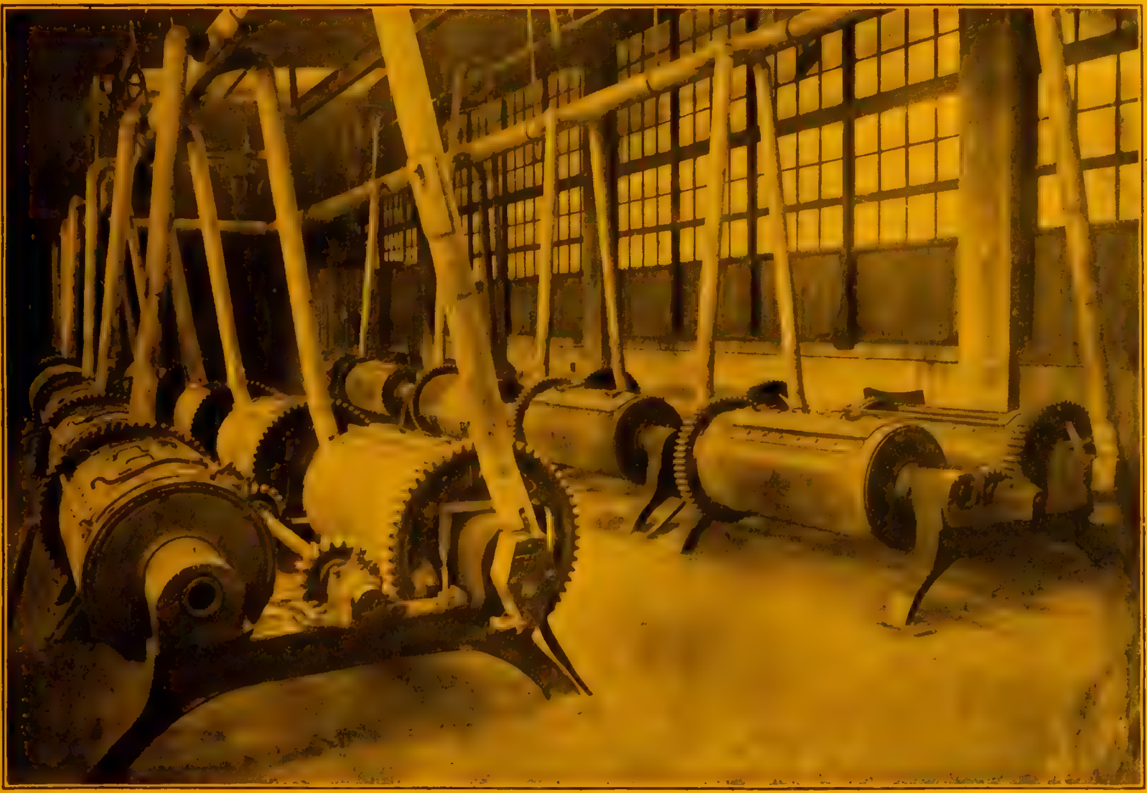
FORMERLY MIDLAND MACHINE COMPANY

SLY FOR SERVICE

Do You Tumble Your Castings?

If not—Why not?

Tumbling castings is an automatic process which releases labor for other purposes, and we make mills to do **Your** particular **Work.**



THIS MILL ROOM

is laid out for efficiency—it is clean and sanitary and a great factor in reducing the cost of the finished product.

Do you need SAND BLAST

CORE OVENS

We make
- **Mills**
- **Rooms**
- **Cabinets**
- **Specialties**
- **Rotary Tables**
- **Pressure Machines**

Drawer Ovens
Rack Ovens
Car Ovens
Core Racks
Core Cars

Iron Cinder Mills
Dust Arresters
Exhaust Fans

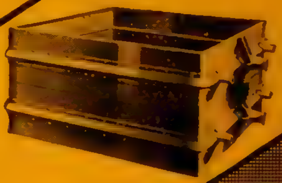
Brass Cinder Mills
Resin Mills
Cupolas

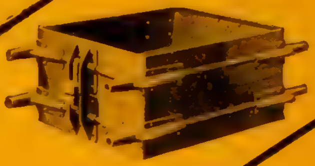
THE W. W. SLY MFG. CO.

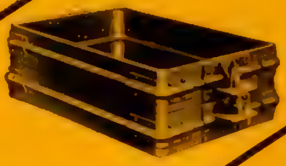
NEW YORK **CLEVELAND, O.** **CHICAGO**

Sterling Steel Flasks

It's the rush times that show-up the wooden flasks and their cast iron partners. SPEED in molding requires flasks that are light, rigid and accurately made which qualifications are not to be found in either cast iron or wood flasks.







Rush-Times have no draw backs when your foundry is equipped with Sterling Rolled-Steel flasks. These compact, light, rigid, accurate and durable flasks will increase the production and improve the product in any foundry.

STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

Milwaukee Wisconsin

ALLIED ALLIED CONSTRUCTION MACHINERY CORPORATION ALLIED
120 Broadway New York, U.S.A.

FLINT SILICA

A Washed, Rewashed, Steam-dried, Screened, Manufactured Product of St. Peter's Rock

A "FIND" for any steel foundry.

A necessity in electric steel practice.

Withstands the highest temperatures. Does not burn or flux.

Has remarkable free-venting properties.

Its uniform purity and freedom from natural bonding material makes it a KNOWN QUANTITY in every sand-mix formula.

Uniform **roundness** of granules gives a clean "draw."

Flint Silica contains nothing to form gases in the mold.

Send for Envelope Sample and Quotations

UNITED STATES SILICA COMPANY

1939 PEOPLES GAS BUILDING
CHICAGO

No. 512

Chrome Tan Leather Legging with extra heavy flare. Affords full leg and foot protection. Easily put on and fits comfortably. No straps or buckles. Very durable.

Conserve Your Man-Power

Every New Employee Costs You Money

Save your skilled workmen by protecting them against burns and accidents and you will save the expense of continually breaking in new men, to say nothing of keeping production, efficiency and morale at its highest point. It has been shown by figures that every new man costs his plant an average of $50 before he is worth anything to it.

WHEELER PROTECTIVE WEARING APPAREL

Is a necessity to-day in every modern plant and foundry. It includes such articles as Asbestos and Fireproofed Duck and Leather Leggings, Spats, Gloves, Mittens, Hand Leathers, Arm Protectors, Coats, Pants, Aprons, Helmets, etc.

Complete catalog No. 1 on request. Send for it to-day.

No. 515

A Special Chrome Tan Leather Legging for molders and foundry workers wearing Congress shoes. Strong, well made and fully protective. An exceptionally good legging.

F. H. WHEELER MFG. CO.

25 EAST JACKSON BLVD., CHICAGO

Look for the

Buffalo

on the octagon Cardboard Spools

VENT WAX

Our customers are our best advertisers. A few of their remarks at the Milwaukee Exhibition were:

"The easiest and best way to vent any core."

"Have used BUFFALO BRAND for years and it never failed yet."

"No other Vent Wax for me: I know what BUFFALO BRAND will do."

Etc., Etc.

Let us add your name to our list of advertisers.

Write for trial spool and prices.

Be SURE it's "BUFFALO BRAND."

UNITED COMPOUND CO.

228 Elk St., Buffalo, N.Y.

THE CYCLONE

Suction Sand Blast Nozzle

A Complete Sand Blast For Cleaning

IRON, STEEL AND BRASS CASTINGS

This Outfit is Guaranteed to Give Satisfaction

No Sand Tanks to Fill **Work Can be Stopped at the Nozzle**

Write for Circular and Price

W. F. STODDER

218 South Geddes Street P. O. Box 747 SYRACUSE, N. Y., U.S.A.

CRANES

Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS LIMITED

WALKERVILLE - - ONTARIO

Cranes, Cupolas, Ladles, Hoists, Tumblers Etc.

SIMPSON INTENSIVE FOUNDRY MIXER

Economical and efficient for all kinds of Sand Mixtures

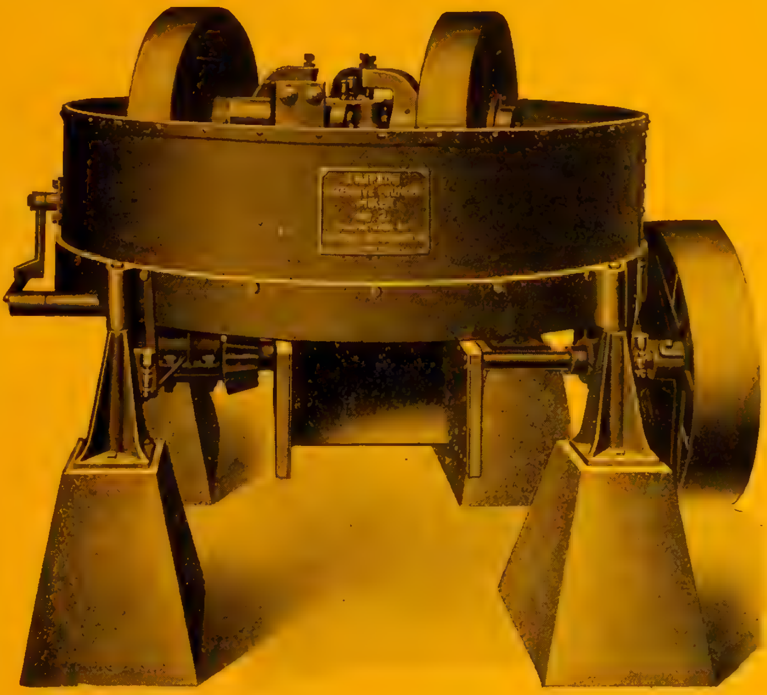
Note the AUTOMATIC DISCHARGE

It saves LABOR BINDER and COAL DUST

It improves the quality of the castings

Its work is done thoroughly not partially

Elasticity and toughness of sand are enormously increased



"The Product of a Practical Foundryman"

It grinds the mixtures together

Small H. P. required with a minimum of repairs

Pays for itself in an incredibly short time

Original porosity of sand mixture maintained

Large capacity with a minimum of labor

Will reclaim old and worn out sand for reuse

¶ The large number of Simpson Mixers in use in Canada and United States testifies to its efficiency. Send for our pamphlet No. 20 and list of users.

Simpson Mixer is made in two sizes

No. 1—4 ft. diameter—H.P. 3¾— 5 H.P. Motor
No. 2—6 ft. diameter—H.P. 7¾—10 H.P. Motor

NATIONAL ENGINEERING COMPANY

Tacoma Building, 5 N. La Salle St.
CHICAGO, ILL.

Semi-Steel Shells and Other High Grade Castings Made of McLain's Semi-Steel Were the Centre of Attraction at the Foundrymen's Convention

Since 1903

we have been advising Semi-Steel for castings that require high tensile or must stand air-hydraulic or other severe tests and foundrymen have finally woke up to the fact that Semi-Steel cannot be made by merely throwing some steel scrap in the cupola. As a result we have sold more copies of McLain's System the *past three months than in any previous twelve months.*

If you're making anything else and *calling it Semi-Steel* you stand to lose the customer you are sending it to when he once gets hold of a McLain Semi-Steel casting—the real Semi-Steel. This has happened many times—so act now. Get in touch with us before it happens to YOU.

Most firms consider it good business to buy anything that will pay for itself in 3 to 4 *years,* but McLain's System has paid for itself in many cases in *three* to *four* weeks.

More than 2900 foundrymen have bought McLain's System

Why?—It's worth the money. You not only know then that your practice is right, but if it isn't—HOW TO MAKE IT RIGHT, it's easy for some one to come into your shop and tell you something new to do—anyone can make changes, but we

Guarantee Our Instructions Mean Savings

on coke—mixtures—better castings, with less melting and casting losses, etc. Get wise to this fact and

Write Us Today---No Charge

McLain's System

700 Goldsmith Bldg.
MILWAUKEE, WISCONSIN

McLAIN'S SEMI-STEEL IS THE KEY TO FOUNDRY PROFITS TODAY

COUPON

McLain's System, 700 Goldsmith Bldg., Milwaukee, Wis.

Send me full information on McLain's Semi-Steel.

Name ....

Firm ....

Address ....

Position ....

11-18

The Business Papers Got The Volunteers

EDWARD N. HURLEY, the clear-headed, resourceful Chairman of the United States Shipping Board—the man who induced Chas. Schwab to take the general management — puts a big rating on the national importance of the business paper. In the recent campaign for shipyard volunteers the business papers aided greatly in getting the required number of men.

Mr. Hurley, writing the Secretary of the Associated Business Papers, which includes a large number of the most progressive in North America, says:

> "I WANT to tell you and those connected with the division of advertising that the services rendered the United States Shipping Board and the Emergency Fleet Corporation by the Business Papers in our recent campaign for shipyard volunteers, deserves our highest commendation.
>
> "The editorials which these papers published and the advertisements bearing coupons and postcards to be filled in by those desiring to enrol in the shipyard volunteers, materially helped us in securing our full quota of volunteers.
>
> "I recognize the great force of the Technical and Trade Press of the country, and particularly in these critical times, both with relation to business as well as to the war.
>
> "Please accept this as a testimonial of my appreciation of your very valuable services and the assistance given us by the Associated Business Papers."

It is only since the beginning of the war that many have come to recognize the value and power of the Business Paper. Manufacturers who have subscribed for and used the Business Press in their own campaigns have long known its power in developing not only the business of its readers but the resources of the country. The Business Paper to-day stands high in the estimation of those executive heads connected with war endeavors, because they realize it is a mighty force in stabilizing business and in giving technical knowledge which cannot be secured in any other way.

Following MacLean Trade and Technical Papers and Magazines stand at the top for Service to readers:

Canadian Grocer
Hardware and Metal
Canadian Machinery
Power House
Canadian Foundryman
Marine Engineering
Dry Goods
Men's Wear Review
Bookseller and Stationer
Sanitary Engineer
Financial Post
MacLean's Magazine
Farmers' Magazine
Printer and Publisher

Send for copy of any in which you interested.

The MacLean Publishing Company, Limited

1207 Union Trust Bldg.
Winnipeg

143-153 University Ave.
TORONTO

Southam Bldg., Bleury St.
Montreal

Hand Power Cranes

Work with Least Effort

This means quicker and more work. Wheels are large and have turned treads. All cranes and trolleys are fitted with roller bearings.

Conveniently Operated

The chain for moving the bridge may be placed in the middle or at either end as desired.

Require Little Clearance

Only four inches clearance needed between center or rail and face of wall.

For complete information about the Pollard Crane or any other machinery, address our nearest house.

10-Ton Electric Crane

for immediate sale, complete with Runway.

DESCRIPTION

Crane

Capacity, 10 tons.
Span, 18 feet.

Motor

Can. Gen. Electric, 3 phase, 60 cycle, 220 volt, 11 h.p.

Runway

Made up of two lengths 15" I Beams, each 120 ft. long, with 40-lb. rail.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg
Saskatoon Calgary Vancouver Victoria

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Foundrymen's Convention Highly Successful

Excellent Exhibits of Machinery and Equipment for the Foundry and Allied Trades Attracted Large Number of Interested Visitors —A Record Attendance of Canadians

MILWAUKEE is to be congratulated upon the extremely successful exhibition of foundry and machine shop equipment held by the American Foundrymen's Association on October 7 to 11, and it may truthfully be said to be the largest exhibition of its kind ever yet held.

This adjunct to the great Allied Metal Congress held in the Milwaukee Auditorium October 21st to 25th comprised one hundred and ninety-five exhibits, covering two whole floors of the vast building that occupies a city square, and entertained during the week many thousand deeply interested visitors.

Very properly, the whole exhibition had for its dominant keynote the saving of labor and the expediting of output in the manufacture of shells, munitions and other materials and supplies necessary to the speedy subjugation of the Hun.

The upper floor, known as the arena, was occupied by still exhibits, in which no moving machinery or power was present, while the lower floor, known as Machinery Hall, was for the most part a heterogeneous, but inter-working, collection of operating exhibits, most of them illustrating new and better methods of executing war contracts.

Providing For Woman Labor

Molding machines for both floor and bench work, newly developed core making and handling machinery, improved and simplified machine shop tools, a variety of devices for carrying and handling heavy loads with the minimum of labor, all pointed to new economies incident to the employment of woman labor, boy labor, or other unskilled labor for tasks that had heretofore been considered as belonging wholly in the province of strong men trained by years of service.

And allied to this timely endeavor to utilize unskilled labor were some exceedingly interesting exhibits of safety garments, safety devices, safety and protective appliances, sanitary equipment, devices and appliances, all contributing to the protection of workers of all ages and both sexes.

Canada And The Convention

It is gratifying to note that a record attendance of Canadian foundrymen and others interested in the associated trades was had. Canadians were over in full force and practically every exhibitor reported enquiries from Canada.

An interesting feature of the exhibition and one which emphasized the importance of the Canadian trade was the badge bearing the words "I'm from Canada" distributed by CANADIAN FOUNDRYMAN. CANADIAN FOUNDRYMAN booth was the active headquarters for Canadian foundrymen all of them registering there and making it their headquarters.

EXHIBITS IN MACHINERY HALL

It is out of the question for us to tell a hundredth of the stories of mechanical genius exemplified in tools and devices exhibited in this wonder-working floor. We can only touch the high spots, and not all of those; and, that none of our friends may charge us with partiality, we will arrange these little stories in alphabetical order.

American Foundry Equipment Company, Cleveland, Ohio. Represented by H. L. Wadsworth, Manager Productions and Designs, and inventor of the Wadsworth Sand Blasting Machinery. V. E. Minich, V. P. and Gen. Mgr., Hutton H. Haley, Western District Mgr. and John D. Alexander, Central District Mgr., represented the Sand Mixing Machine Company. This company showed a 9 foot humane, rotary, sand blasting chamber, in which the castings to be cleaned are loaded on the circular floor or grating on the outside of the cabinet, and when loaded the turntable is given a half turn, throwing these materials on the inside of an enclosed room. The operators work from the outside, grasping a blasting hose with covered hands and arms that are thrust through a continuous canvas pocket, and watching their work through a window that is protected on the inside by a wire screen. This is one of the many sand blasting devices made by this company.

American Molding Machine Co., Terre Haute, Ind. Molding machines represented by photographs and literature shown by W. C. Norcross, Pres.; Louis J. Cox, Treas.

Mr. Norcross has a national reputation as an inventor and promoter of efficient molding machines, and some of his inventions are still being manufactured by the Arcade Manufacturing Company of Freeport, Illinois, though the majority of his new models are now being turned out by the new company above listed, a company that is strongly backed financially, and is erecting a modern plant for the production of the Norcross devices. Mr. Norcross expressed regret that his company was so far behind in its orders that it could not spare any machines for an exhibit at Milwaukee, and he wished us to extend an invitation to Canadian manufacturers to visit the Canadian Steel Company at its Montreal and Welland plants, where they would see in operation six 24 x 36 inch jolt strippers making steel drawbars and drawbar knuckles for cars, and three 60 x 72 inch jolt strippers for steel draftarms for freight cars.

Bastian-Blessing Co., W. Austin Ave., at La Salle St., Chicago. Welding and cutting apparatus.

Represented by L. G. Blessing, general manager; M. Keith Dunham, engineer; F. W. Munson and S. H. Smith, salesmen.

This company performed some hair-raising stunts to demonstrate the fact that their welding and cutting torches could not back-fire; among other things, working in a tight corner until the point became red hot. This feature of safety was accomplished, they explained, by reversing the ordinary percentages of oxygen and acetylene in the mixture, an intimate blending of the two gases being accomplished by a unique method of chambering the torch.

Battle Creek Sand Sifter Co., Battle Creek, Mich. Simplex air driven sand sifter, hand or belt driven sand sifter, Wild Deer blacking sprayers, and safety deposit boxes.

Represented by R. R. Wilder, manager, who explained that the rectangular body of the Simplex Sifter gave 76% larger screening area than an 18 inch circular sieve, and that this machine required only one to two cubic feet of air per minute. The demonstration of the machine attracted favorable attention.

The Berkshire Manufacturing Company, Cleveland, Ohio. Air squeezer molding machines, hand squeezer molding machines, stripping plate machine vibrators, snap flasks and flask fittings, and patterns.

Represented by W. D. Fraser, manager, and G. L. Cannon, representative.

Blystone Manufacturing Company, Cambridge Springs, Pennsylvania. Blystone 7 foot power driven core sand mixer with screen and equipped with power dump.

Represented by L. G. Conroe, J. A. Scully and H. R. Scully, Chicago; Wm. Oberhelman, Birmingham, Ala., and J. M. Witters, Milwaukee.

Brown Specialty Machinery Company, 2528 W. 48th Place, Chicago. Hammer core machines, duplex shakers, sand blast equipment, and pneumatic charging trucks.

Represented by Elmer A. Rich, Jr., president; Herbert T. Rich, secretary; J. E. Sweet, sales manager; John Laycock, superintendent, and Robert Laycock, assistant superintendent.

Perhaps the centre of interest was the 84 inch vertical rotary sand blasting chamber, in which four revolving nozzles are staggered so as to reach three sides of the materials to be blasted, requiring only one turning of the castings on the table for a complete job. This rotary table was equipped with a complete elevating, separating and returning system, and Mr. Rich demonstrated the instant manner in which the flow of sand was stopped whenever the table itself was stopped.

Their No. 1 revolving sand blast barrel also attracted favorable attention. It is equipped with a nozzle at either end, and the sand flows by gravity through the perforations in the cylinder and is recovered from the chamber below.

Their charging machine, air operated, contained interesting features that contributed not only to the speed of operation, but to the comfort of the operator.

Central Electric Co., 316 Wells St., Chicago. Latest developments in lighting fixtures for machine shop and foundry illumination, as covered by the Maxolite line. Ralco plugs and receptacles and other electrical specialties. Illuminating engineers will be present to confer on lighting problems.

Messrs. Albert L. Arenberg, illuminating engineer, and Fred L. Warner, sales engineer, were both on hand to explain the advantages of the Maxolite Diffusor, a large lighting unit which can be hung high above a foundry or machine shop and diffuse the equivalent of sunlight over a wide area without casting objectionable shadows, in fact, scarcely any shadow at all, and at the same time being free from glare. This is a relatively young company, but it is growing remarkably, both because of the excellent features of its various lighting units, and one might say particularly because of the engineering skill and intelligence with which the service department of the company takes care of its clients.

Champion Foundry & Machine Company, 2419 West 14th st., Chicago. Jolt rollover power draw machine cores and molds and Champion motor driven sand riddle.

Represented by T. J. Magnuson, president; H. O. Magnuson, secretary and treasurer, and Anton Magnuson, superintendent.

President Magnuson demonstrated the ease with which the jolt rollover machine could be operated by a woman, either for core work or on the foundry floor, turning out its load in about twenty-five seconds. He was enthusiastic over his sales closed at the exhibit for both his molding machines and riddles.

Cleveland Osborn Manufacturing Co., Inc., 5401 Hamilton Ave., Cleveland, Ohio. Direct draw rollover jolt machines, stripping plate jolt machines, combination jolt stripping squeezer machines, combination jolt squeezer machines, plain air squeezer machines, plain jarring machines; all power machines in operation. Little Wonder rollover machines and stripping plate machines.

Represented by H. R. Atwater, vice-president; E. S. Carman, chief engineer; J. C. Alberts, E. J. Byerlein, E. T. Doddridge, H. E. Deakins, E. W. Jacobi and F. T. Spikerman, sales engineers.

Their combined stripping plate jolt machine handled two semi-steel shells at a time and their representative stated that this machine was turning out 350 6 inch trench mortar shells a day in actual practice. In the demonstration at Milwaukee the vanes of these shells were set loose on the pattern to illustrate how the pouring of the metal would weld these vanes in place on the shells. The jolt strip squeezer demonstrated was mounted for turning out fly wheels for Chevrolet motors.

Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, Ohio. Riveting hammers, chipping hammers, air drills, compound drills, corner drills, angle gears, valve grinders, emery grinders, sand rammers, core breakers, Bowes couplings, Cleco air valves, Cleco Y fittings, Cleco neverslip hose clamps, menders and nipples, wire hose clamp tools, etc.

Represented by H. S. Covey, general sales manager; Arthur Scott, superintendent; Guy Gregory, manager New York office; F. E. Schwarze, manager Philadelphia office; H. C. Newton, manager Chicago office; Captain F. H. Burr, manager southern district, and C. D. Garner, manager Toronto office.

Mr. Covey was enthusiastic over the demand for the Bowes couplings, which are air seated, and connect and disconnect with a quarter turn. He said that they were making 200,000 of these couplings a month for ship yards, and that a recent order for 83,000 couplings from the Hog Island yard alone was probably the largest order for hose couplings ever placed. He said that his company was months behind its orders, and that its entire output was going into war work in the United States and Canada. The company makes sixty-one different types and sizes of pneumatic drills, twenty types and sizes of chipping hammers, fifteen of riveting hammers and five of sand rammers, besides a great variety of fittings for foundry and sand blasting machines. They are building a new factory in Cleveland in which one hundred and fifty women will be employed, a factory that Mr. Covey believes will be well worth a visit from any prospective employer of women in industrial work because of the great length to which his company has gone in providing for the safety and comforts and happiness of the women and girls employed. The Cleveland Pneumatic Tool Company, Ltd., 84 Chestnut Street, Toronto, Canada, was represented by Mr. C. D. Garner, Canadian manager.

Clipper Belt Lacer Co., Grand Rapids, Mich. Clipper belt lacer, baby lacer, and clipper belt hooks.

Represented by Paul P. Rohns, secretary and sales manager, and P. E. Crothers, factory representative.

The growth of this company in the last five years is one of the modern marvels as their operating floor space is about four times as large as it was four years ago, but is inadequate at the present moment to keep pace with the extraordinary demand for clipper belt lacers. As usual, nearly all of the operating machinery in the exhibits at the convention were belt laced with "clippers," giving the company a multitude of operating exhibits which spoke for themselves.

Davis-Bournonville Company, 143 W. Austin Ave., Chicago. Live exhibit showing No. 2 Oxygraph for cutting dies and shapes in steel, 2 operations simultaneously; No. 1 Oxygraph, Radiagraph for cutting boiler plate; Magnetograph for cutting circles 2 to 12½ inches in diameter; 200 lb. Acetylene Generator that has passed the National Board of Fire Underwriters; 20 Way Oxygen Manifold and a cabinet truck, complete with welding and cutting unit. Truck will accommodate Acetylene and Oxygen tanks.

Represented by F. C. Whitney, general sales manager; R. O. Mueller, salesman Wisconsin district; C. F. Williams, erecting engineer; A. C. Collins, manager St. Louis office; J. R. Wilson, manager Detroit office; Fred Maeurer, superintendent Chicago shop; Harrison Bird, Chicago office, covering territory south of Chicago, and W. R. Noxon, manager Chicago office.

Mr. Whitney, who was generalissimo of this large and intensely interesting working exhibit, had a crowd of keen information-seekers constantly pressing up to the rail, and it required the utmost alertness of his entire force of operatives and information-givers to keep pace with the demand for practical data. The demonstration of the Oxygraph was of special interest to shipbuilding visitors, as this novel machine will cut a porthole out of the steel side of a ship in less minutes than it will require hours by the old method. The Radiagraph too held no less interest for all workers in boiler plate, whether in ship yards or elsewhere, as it demonstrated its ability to cut patterns by straight lines or zig zag, to suit almost every requirement of modern times. It was also demonstrated in cutting cast steel risers as thick as 36 inches.

Deister Concentrator Co., Fort Wayne, Ind. Deister-Overstrom diagonal-deck laboratory-size foundry residue table.

Represented B. J. Roberts, secretary and general manager.

Mr. Roberts demonstrated by the small concentrator table in his exhibit how the full size table would conserve metal values by its power of separating foundry waste of all kinds, as well as its practical use in separating coal from foreign matter. He expressed himself as highly pleased with the results of the exhibit, which is opening up a new field to be added to the company's already large business in the metal mining industries.

Dings Magnetic Separator Company, 671 Smith Street, Milwaukee, Wis. Magnetic separators in operation.

Represented by R. A. Manegold, president; E. S. Hirschberg, general superintendent; G. H. Fobian, engineer, and R. Kretchmar, sales engineer.

An interesting feature of this exhibit was type 0 portable separator, which is finding a large market for the recovery of low grade values in dumps surrounding foundries and steel using plants, also for use inside of plants.

Another machine was their type M for separating iron and steel from brass chips and other non-ferrous scrap of a finely divided character.

Electric Furnace Co., Alliance, Ohio. Photographs of furnace installations and speciments of the various products produced by these furnaces, all of which are on war material.

Represented by Chas. L. Foster, Alliance, O., sales manager, and Dwight D. Miller, New York.

This furnace is made in types for both steel and non-ferrous metals. One type was shown which produces forging billets for Liberty motor crank shafts, with another type of furnace for heat treating the forged shaft. Other furnaces were shown which were designed for aluminum, brass, copper and non-ferrous alloys. On these they claim that volatile losses are reduced to about one per cent. on new metal and not to exceed one and one-half per cent. on scrap. The economy of operation of Bailey furnaces is illustrated by the company's claim that average upkeep covering a period of years does not exceed 50c a ton.

Great Western Manufacturing Company, Leavenworth, Kansas. Gyratory foundry riddles.

Represented by F. A. Pickett, secretary, and Geo. W. Combs, superintendent.

The large capacity of Great Western riddles, due to the gyratory motion, was demonstrated to the satisfaction of a continuous stream of visitors at this booth.

Grimes Molding Machine Company, 1218 Hastings st., Detroit, Mich. Small Grimes jolt rollover molding machines, Grimes hand-rammed rollover machine, and small rollover core machine.

Represented by George L. Grimes, president and general manager; L. V. Grimes, and Chas. J. Skeffington, salesmen.

Hausfield Company, Harrison, Ohio. Tilting non-crucible melting furnace, tilting crucible melting furnace, tilting aluminum melting furnace, vibrators, Fyrite high temperature cement, and refractory fire brick.

Represented by Jos. E. Hausfeld, treasurer; J. S. Armour, manager; C. E. Haddock and Mr. Statham.

One of the interesting features of the Hausfeld furnace is the application to it of the Maxon Premix, a device which mechanically mixes air with the gas by the introduction of a fan velocity, never hitherto applied to such a purpose, the consequence being the combustion of a larger percentage of oxygen with a smaller percentage of gas than has been practicable by any other method.

Haynes Stellite Co., Kokomo, Ind. Represented by P. P. Hale, sales engineer; C. C. Kerlin, assistant engineer, and E. H. Lurker, district manager, displayed cabinets of samples of Stellite in form of bits and bar stock, as well as in the form of finished milling cutters, reamers, and tools of special shapes. Another exhibit showed how Stellite is welded to steel shanks. A novelty to indicate the wide range of possibilities of Stellite was a display of Stellite surgical and dental instruments, cutlery and tableware.

Imperial Brass Manufacturing Company, 1200 W. Harrison St., Chicago. Oxy-acetylene and oxy-hydrogen welding and cutting apparatus.

Represented by W. S. Noyes, manager; J. Schroeter, engineer, and R. Austin, operator.

This working exhibit of cutting and welding was one of the interesting and educational features of Machinery Hall, and we are informed that the company booked a gratifying amount direct orders at the booth. Their method of reclaiming defective castings by rebuilding was particularly impressive.

Kearney & Trecker Co., 60th & National Avenues, Milwaukee, Wis. Plain milling machine and vertical milling machine, both in operation, turning out factory parts, which were delivered nightly to the plant.

Represented by Theodore Trecker, president; E. J. Kearney, secretary and treasurer; J. A. Camm, sales manager; W. H. Allen, Chicago representative, and C. C. Bauschke, Cleveland representative.

The Milwaukee milling machine is in such widespread use in Canada that no comment is necessary here. The growth of this company's plant and business is one of the industrial wonders of Milwaukee, and it was the privilege of many visitors to the Allied Metal Congress to visit the Kearney & Trecker plant at West Allis during the convention. Williams & Wilson of Toronto are their Canadian distributors.

Kempsmith Mfg. Co., Station "A," Milwaukee, Wis. Two milling machines, motor driven, both of them operating on manufacturing work.

Represented by Paul E. Thomas, president and general manager; John Goetz, vice-president and works manager; Fred E. Parsons, chief engineer; E. E. Leason, purchasing agent; Peter Lowe, sales manager; R. F. Shaw, general superintendent and supervisor of foundries; Charles Drewes, superintendent of experimental work; F. M. Butterfield, assistant sales manager; Fred Steck, foreman milling machine department, and Ed. Karow, foreman of chucking lathe department, and milling expert.

The No. 4 single pulley drive Kempsmith miller with Stellite cutters was shown here for the first time. Among its novel features are its wedge locked overhanging arm which automatically aligns the arbor with the spindle; also a new means for insuring the quick traverse to the table in all directions. They also showed their stand No. 33 plain manufacturing miller and their well known No. 3 universal tool room machine.

Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa. Curve Drawing Temperature Recorder. Used as automatic central station unit for operating signal lights and deviation meter at furnace. One multiple point temperature recorder used as automatic central station unit for operating signal lights and deviation meter at furnace. Transformation Point Equipment for determining critical points of steel and an Optical Pyrometer.

Represented by Henry Brewer and George W. Tall, Jr.

Magnetic Mfg. Co., 764 Windlake Avenue., Milwaukee, Wis. Foundry magnetic separator with elevator for handling foundry refuse material, magnetic pulley and magnetic pulley type separator. Magnetic separators for use in brass and aluminum foundries.

Represented by Alvin Dings, president; John P. Bethke, secretary, and Roswell H. Stearns, treasurer.

Their method of ventilating their magnetic pulley and keeping it cool by means of air circulation impelled by the belt was described as increasing the magnetic storage capacity of the pulley from 15 to 40% per square inch, as compared with non-ventilated pulleys.

McCrosky Reamer Company, Meadville, Pa. Wizard quick change chuck and collets in actual operation. New style super adjustable and ideal reamers, McCrosky turrets for engine lathes, Wizard variable speed and reversing attachments for drill presses and universal lamp brackets for shop uses.

Represented by C. M. Sutton, sales manager, and M. J. Foulk, demonstrator.

The Wizard variable speed attachment was demonstrated to show its three forward speeds and reverse, with one spindle speed. The Wizard chuck has the interesting feature of being removable without stopping the machine. The McCrosky super adjustable reamer, made in both hand machine and shell type from high speed or carbon steel, differs from other adjustable reamers in that its blades are removed in a forward direction instead of backward. It was claimed that six sizes of blades are sufficient to cover the whole range of reamers from 15/16 to 6-inch sizes.

Mercury Manufacturing Co., 4113 So. Halsted St., Chicago, Ill. "The trackless train," a mercury 3-wheel electric industrial tractor and stereopticon slides of the tractor in operation.

Represented by W. W. Pace, director of advertising, E. Lowenhertz and A. D. Shanks, salesmen.

The locomotive shown was their 10 ton unit with a rating of 1,250 pounds pull at the drawbar. Mr. Pace reported that Canadian visitors showed a special interest, and particularly those that had contracts for heavy-tonnage shells and munition.

Modern Tool Co., Erie Pa. The features of this exhibit were an 8 x 18 plain cylindrical grinding machine of the new self contained type, with all countershafts in the machine, which was demonstrated under power. Also, the magic, quick change chucks and self-opening die heads; also their type "F" floating head for use in automatic screw machines, which was shown for the first time at this exhibit. Of particular interest to the Canadian visitors was their 12-inch grinder in operation, grinding the bourelet on 75 and 155 millimeter shells, with a precision that seemed to satisfy the most exacting.

Represented by R. H. Wood, manager Chicago office, and C. E. McArthur, manager machinery department, Erie, Pa.

Napier Saw Works, Inc., Springfield, Mass. Western branch, 515 Jackson Blvd., Chicago. Metal cutting equipment, band saw machines, hack saws, band saws, circular saws, etc.

Represented by J. H. Green, Chicago branch mgr.; B. L. Calkins, L. C. Howard, and J. J. Pendergast, salesmen.

Their band saw is built on a new principle which offers not only increased speed but greater range of sizes, this saw being particularly recommended by its makers for cutting the semi-steel shells. At the demonstration in the booth they cut 1-15-16 semi-steel rounds in fifteen seconds.

National Engineering Company, 5 N. La Salle St., Chicago. Represented by H. S Simpson, mgr., who demonstrated the Simpson intensive foundry mixer in actual operation demonstrating its efficiency for the preparation of foundry sands. Illustrated matter describing Simpson bucker loader, Simpson core reducer and other specialties. Also a Tabor shockless jarring rollover pattern machine with 10-inch draw, suitable for handling semi-steel shells. This machine was borrowed from the Campbell Manufacturing & Foundry Company of Milwaukee for use at this exhibit.

Norton Company, Worcester, Mass. Represented by Herbert Duckworth, asst. sales mgr.; H. W. Dunbar, Norton Grinding Co ; G. W. Thomson, Chicago mgr.; C. B. Yeomans. W. N. Jove, J. B. Eckstedt, and H. K. Clark, salesmen.

In addition to their regular line of grinders they introduced for the first time a balancing arrangement which can be applied to all sizes of wheels with large size holes. This balancing arrangement consists of an iron collar inside, filled with lead weights at close intervals, the unscrewing of weights at the proper places giving the perfect balance. Another type consisted of a steel slip band with counter weights, the slipping of the band performing the balancing function. They described but did not exhibit a new wheel for grinding the outside and inside of shells.

Oliver Machinery Co., Grand Rapids, Mich. Pattern shop machinery and engine lathes, Oliver No. 102 universal wood milling machine and other machines in operation.

Represented by A. S. Kurkjian, sales manager; J. C. Whitney, manager Chicago district; W. F. Reading, sales engineer; M. D. Baldwin vice-president; R. F. Baldwin, treasurer, and H. Steenbergen and K. Lugthart, demonstrators.

In this exhibit interest centred around their No. 75 wood milling machine, their new 4 speed A-C motor-driven lathe and their No. 102 wood milling machine. The last named machine was turning out core boxes and patterns to demonstrate its adaptability to that sort of work. A No. 18 Oliver tool room engine lathe was shown as representing a long line of lathes of that type.

A new and handy device for embossing type for patterns for casting names and numbers in machine parts, etc., was the source of much pleased comment.

Phoenix Manufacturing Co., Eau Claire, Wis. Represented by I. B. Roland, Martin A. Hanson, and W. L. Harrison.

This working exhibit included a new turret attachment for engine lathes which converts an ordinary engine lathe to a semi-turret lathe. It was explained that large numbers of these attachments are being used in turning shells and shell bands, and that large sales have been made in Canada.

Henry E. Pridmore, Inc., 1901 So. Rockwell St., Chicago. Combination electric jar-ramming and air power rock-stripping plate machine, combination electric jar-ramming and air power stripping plate machcine, combination electric jar-ramming and hand rock-over drop machine, power rock-over drop machine, heavy double shaft machine, rock-over drop machines, rock-over drop core machine, square stand machine and heavy double shaft stripping plate machines.

Represented by Mrs. Henry E. Pridmore, president and treasurer; Henry A. Pridmore. vice-president & secretary; Marshall E. Pridmore, D. F. Eagan, C. H. Ellis, J. W. Dopp, Hugh Gallagher and Henry G. Schlichter.

The 24-inch electric jolt stripper, designed especially for molding shells, is a new machine recently completed and exhibited here for the first time. It makes a clean vertical draw for any size of shell. The electric jolt power rollover, specially designed for millimeter shhells, can be rigged up for either one or two shells in a flask.

Simonds Manufacturing Co., Fitchburg, Mass., and Chicago. Complete line of metal cutting cold saws, hack saws and files, with a special demonstration of the cutting qualities of a Simonds' inserted tooth metal saw.

Represented by J. W. McLean, Chicago manager and H. B. McDonald.

A most interesting feature of this exhibit is a new metal cutting inserted-point saw at work cutting steel bars up to 5 inches in diameter. It was explained that this saw is peculiarly adapted to cutting semi-steel shells, and that a number of sales had been made for that purpose. The exhibit also included metal cutting hack saws, files, solid metal saws, metal slitters, etc.

Sullivan Machinery Company, 122 So. Michigan Ave., Chicago.

Air Compressors in operation.

Represented by Jos. H. Brown, district sales manager; H. T. Walsh, general sales manager; S. B. King, advertising manager, and H. F. Mernard, sales department.

The only exhibit of this great builder of air compressors was a large angle compound compressor delivering 445 cubic feet of air per minute, which supplied air to all the working exhibits on the floor. The company's representatives were on hand, of course, with their photographs and literature.

The Tabor Manufacturing Co., 1740 Hamilton St., Philadelphia, Pa. 18 in. portable combination shockless jarring roll-over and pattern drawing molding machine, and complete set of photographs and catalogues.

Represented by Wilfred Lewis, president; H. W. Brown, secretary; J. T. Ramsden, chief engineer; J. P. Fender, J. Degler, W. E. Sewell, D. J. Martin, J. H. Coleman, H. W. Impey, G. L. Sumner, E. S. Lewis, E. A. Platt and Philip Shire.

Torchweld Equipment Company, Fulton & Carpenter Sts., Chicago. Welding torches, cutting torches, decarbonizing torches, lead burning torches, regulators, welding and cutting hose, accessories, welding rods and wire, and fluxes.

Represented by C. J. Nyquist, president; W. A. Slack, secretary and sales manager; H. R. Fenstemaker, Wisconsin representative, and N. Havies, demonstrator.

The demonstrators in charge emphasized the evenness of the pressure they secured by the peculiar formation of the mixing chambers of their torches, which permitted the use of equal volumes of acetylene and oxygen. They also claimed that this mixture made a weld that is softer than ordinary mixtures and therefore more easily machined.

Wadsworth Core Machine & Equipment Co., Akron, Ohio. Wadsworth navy type motor driven core making machine, Wadsworth navy type motor driven cutting off and coning machine, and assortment of Wadsworth never break all steel reinforced core trays.

Represented by Geo. H. Wadsworth, president and general manager, and M. C. Sammons. secretary.

Warner & Swasey Company, 5701 Carnegie Ave., Cleveland, Ohio. Universal hollow hexagon turret lathe on bar work, a machine suited for shell work when equipped with special tools. This machine was demonstrated on a neat job of pinion shaft turning.

Their No. 4 universal turret screw machine was shown chucking cast iron chuck cones. It was described as adapted for fuse work.

Represented by A. C. Cook, sales manager, Cleveland; H. E. Witham, manager Chicago office, and C. E. Neubert, salesman Chicago office.

E. J. Woodison Company, Detroit, Mich. Morrison electric jar ram rollover molding machine (wholly electric), Woodison Webb air squeezer, the Woodison Swan jar-ram roll-over core machine, the Woodison universal core machine and Woodison Tepper roll-over draw core machine, the Downer grinder. Foundry facings, foundry supplies, platers' and polishers' supplies.

The Woodison Universal, a radically new machine, was described as being fool proof and peculiarly adapted to woman labor.

A beautiful reproduction of the Woodison plant at Detroit in miniature, built from cores made with Woodison's core oil and lighted with electricity, enlisted many exclamations of pleased surprise, especially from the lady visitors.

Represented by E. J. Woodison, president.; C. H. Woodison, vice-president; C. D. Yahne, treasurer; J. C. Woodison, secretary; G. A. Burman, manager oil department; J. F. Webb, manager molding machine department; W. J. Wark, manager Buffalo office; U. W. Frink, manager Boston office; W. F. Haggman, manager Seattle office; M. A. Bell, manager St. Louis office; R. S. Hoffman, manager Cleveland office; H. A. Taylor, Michigan salesman; J. M. Witters, Wisconsin salesman; A. F. Jordan, Detroit salesman; W. B. Bowring, Detroit salesman; D. D. Baxter, New York salesman, M. M. Werckman, Ohio salesman; F. F. Shortsleeves, Western salesman, and Wm. Maybank, Canadian salesman.

Young Brothers Company 313 Franklin St., Detroit, Mich. Represented by George A. Young, secretary and treasurer; R. B. Reed, sales manager; C. C. Bradford, sales representative; H. L. Ritts, and G. G. Parry, sales engineers.

Exhibited a large core oven built from insulated double walled sheet steel with mechanical exhaust to insure evenness of temperature. This oven may be heated with electricity, gas, coal or coke. It is the same oven that is in use by the International Harvester Company at Hamilton and the McCleary Bicycle Works at Toronto.

EXHIBITORS IN ARENA

Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Hydraulic machinery: Hydraulic turbine governor, single stage type "S" centrifugal pump, two model waterwheel runners, and photographs showing various installations.

Electrical apparatus: Motor-driven stationary air compressor, and photographs of actual installations.

Steam turbine apparatus: Display of steam turbine blading samples, showing blading foundation rings, shroud rings, etc., and photographs showing actual installations.

Mining machinery, tractors and engines. Photographs of actual installations.

Represented by Otto H. Falk, president; H. Woodland, treasurer; Max W. Babb, V.-P.; C. E. Searle, general representative sales board; C. Edwin Search, general works manager; A. E. Harrison, asst, gen. works manager; H. A. Balding, Wilwaukee, district manager, and A. P. Hauck.

Brass World Publishing Co., Elm and Duane Strets, New York. The Brass World.

Represented by C. N. Manfred, general manager; William F. Carns and George A. Jones, advertising representatives.

Joseph Dixon Crucible Co., Jersey City, N. J. Crucibles, covers, stirrers, stoppers, sand crucibles, scorifiers, cupels, etc.

Represented by D. A. Johnson, district representative, Chicago branch; F. R. Brandon, H. C. Sorenson, and W. B. Allen, Chicago branch, and A. L. Haasis, Geo. Neighbor and Malcolm MacNaughton, Jersey City, N. J.

As might be expected, the exhibit of this company was one of dignity and beauty. It included crucibles, stirrers, covers, stoppers, sand crucibles, scorifiers, cupels, etc. Mr. Moses, an attache of the New York office, in touch with the foreign situation said, "Necessity has compelled America and Canada to develop American clays instead of depending upon the German source of supply, and such marked success has attended these efforts that it is pretty certain that we will never go back to our German source of supply." They distributed as souvenirs Dixon lead pencils, erasers, and a catchy trick novelty known as "the naked truth."

General Steel Company, Public Service Bldg., Milwaukee, Wis. Steel samples of ingots and billets. Photographs. Represented by R. C. Gosrow, sales manager; E. Gruhl, vice-president, and F. E. Patton, works manager.

By photographs of their plant and samples of work they showed interesting developments of the Pittsburgh electric furnace in the feed of costly alloy steels. Samples were shown of ingots of chrome vanadium steel from which ball races for heavy ordnance were made, and of the 3½ per cent. nickel steel used in engine propeller shafts, and similar government work. They operate two 10-ton and one 1½-ton Pittsburgh furnaces.

Holcomb Safety Garment Company, 14 So. Jefferson St , Chicago. Full line of fireproof garments. including gloves, mittens, aprons, leggings. spats, and other wearing apparel made from asbestos cloth, leather and fireproofed duck, for the protection of molders and steel plant operators.

Represented by C. R. Holcomb, president, and A. F. Cutter, secretary.

Mr. Holcomb was enthusiastic about the deep interest shown by visitors in protective garments. an interest surpassing all former years. He believed that this indicated a closer fellowship between employer and employee quite as much as it did a desire to avoid financial loss due to personal injury claims.

Foundry Equipment Co., 1831 Columbus Road, Cleveland, Ohio. Photographs (enlarged) of various Coleman core and mold ovens and furnace installations.

Represented by F. A. Coleman, vice-president and general manager, and C. A. Barnett, treasurer.

Holland Core Oil Co., Chicago. Core oils, various dry binders, parting compounds, Kleen Kore (core wash) and sample cores from foundries using their core binders.

Represented by H. L. Baumgardner, president and general manager; Garrett W. Doty, superintendent, manufacture and sale of dry core compound; James M. O'Hara, manager oils and chemicals; Harry Whiting, plant superintendent; R. E. Pickerell, office manager; Seth Vining, chemist; Sam Dykstra and A. G. Chambers, traveling salesman.

This exhibit bore a flaming electric sign displaying the words, "Originators of Core Oil."

Illinois Clay Products Company, Oglesby, Ill. Represented by Otis L. Jones, manager, showed samples of raw and ground clays, photos of the company's clay mines and mills and literature describing the advantages of these clays for cupolas, furnaces, steel and gray iron foundries.

Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago. Electric furnaces for steel foundries.

Represented by F. von Schlegell, president; C. B. Fletcher, secretary and treasurer; W. B. Lewis, manager installation and service; M. G. Carhart and George B. Cross, salesmen.

Photographs of over 50 Snyder electric furnaces were shown, and the men in charge of the booth were armed with intensely interesting data as to the economy and efficiency and marked earning power of this pioneer type of electric furnace as improved and developed under the present management.

Charles C. Kawin Company, 431 South Dearborn St., Chicago. Chemists, foundry engineers and metallurgists.

Represented by Charles C. Kawin, president; J. F. Nellis, vice-president; C. A. La Fever, vice-president in charge of engineering department; J. H. Hopp, secretary; James Jordan, Canadian and Eastern representative, Buffalo, N.Y.; Wm. J. Mulcahy, secretary of San Francisco branch; A. M. Knight, Dayton branch, and R. F. Maine, director of laboratories, Chicago.

Pleased patrons of this enterprising engineering concern from all over the United States and Canada called at the booth in order to tell Mr. Kawin and his associates how admirably and effectively their expert assistance and advice have assisted in meeting the extraordinary demands of the war period in both quality and quantity of output.

McLain's System, Inc., 808 Goldsmith Building, Milwaukee, Wis. Samples of semi-steel castings of light sections, such as automobile cylinders and other castings containing 20 to 50 per cent steel, made by McLain graduates, and 6 in., 8 in. and other size projectiles, containing 20 to 30 per cent. steel scrap.

Represented by David McLain, president; I. V. Scanlan, secretary and treasurer, Arthur Akey, R. H. Moody and Thomas McCarthy.

That the gospel of semi-steel that Mr. McLain has been preaching for so many years has fitted his students to play a useful part in supplying the allies with munitions was testified to by hundreds of graduates who called at the booth. The samples of shells made from mixtures containing 30 per cent. steel scrap interested everybody, as did also the cast semi-steel aeroplane pistons and the sample of 5-32 inch semi-steel which had been machined down from the original 3-16 in. semi-steel casting, in which 25 per cent of the charge consisted of steel scrap. Other samples showed as high as 50 per cent steel scrap in the mixture.

McLain-Carter Furnace Co., 806 Goldsmith Building, Milwaukee, Wis. Open hearth steel castings poured from metal made in the McLain-Carter oil-fired furnace.

Represented by David McLain, president; Frank Carter, vice-president; I. V. Scanlan, secretary-treasurer, and Fred Smith, engineer.

The 5-ton McLain-Carter furnace in operation in the Geo. H. Smith Steel Castings plant in Milwaukee was visited by many during the convention, and its work of producing crucible-size castings from open hearth steel containing only 15 per cent to 20 per cent. pig iron was a subject of favorable comment.

MacLean Publishing Co., Ltd., Toronto, Canada. Canadian Foundryman & Canadian Machinery.

Represented by B. G. Newton, manager and A. H. Byrne, Western representative.

Mechanical Appliance Co., 133 Stewart St., Milwaukee, Wis. Builders of Watson electric motors and generators.

Represented by Walter Crabtree, Irving Douglas, John McC. Price and Miles E. Standish.

Metal Block Corporation, Chicago, Eastern Brass and Ingot Corp., Waterbury, Conn. Represented by J. L. McKay, exhibited samples of briquet-ingots, made from brass chips and from copper shell band turnings by the Duryea process. This process was explained by Mr. McKay as involving a unique and remarkably thorough purification of the metal and the compacting of the purified mass into solid ingot form by a combination of pressure and shock, which practically flows or welds the particles into a homogeneous mass almost as solid and practically as pure as cast ingots of new metal.

The briquetting of brass by this process has been carried on for several years at the rate of several million pounds a month, but the briquetting of copper shell turnings is a recent development of special interest to shell makers

Mifflin Chemical Corporation, Mifflin st. Wharf, Philadelphia, Pa. "Core-Mol" Binder. Represented by Philip Publicker, pres., and A. H. Selling, mgr. New York office.

New Chicago Crucible Co., Chicago. Showed a complete range of sizes of crucibles such as are used in the metal industries, as well as stoppers and nozzles.

This plant, within the enclosure of the works of the Northwestern Terra Cotta Company, 2500 Clybourn ave., Chicago, is claimed by Dr. Taylor to be the largest crucible kiln plant in America—if not the world.

Marked success was claimed in the development of high-refractory, long-lasting crucibles from American clays.

Represented by Dr. Sherman Taylor, pres.; A. F. Hottinger, sec.-treas.; L. C. Taylor, Supt.; H. J. Lucas, sales mgr.; J. G. Crowe, J. P. Foraker, and J. W. Mann, salesmen.

S. Obermayer Company, Chicago. Tumbling barrels, ladles, core ovens, sprue cutters, supplies, etc.

Represented by S. T. Johnson, vice-pres.; J. J. McDevitt, J. E. Evans, O. J. Peterson, G. P. Peterson, A. N. Wallin, W. H. Fitzpatrick, sr., W. H. Fitzpatrick, jr., C. M. Barker and W. Fenton, representatives.

As usual the Obermayer exhibit was impressive as to size, attractive in its decorations and of absorbing interest because of the great variety of the devices and supplies displayed.

Amongst the foundry-equipment units shown were an outside-feed rosin mill, an inside-feed rosin mill; a belt-power sprue-cutter, three types of portable core-ovens and a stationary core oven; three sizes of Whiting brass furnaces, Whiting spin gear and worm gear ladles; a Champion electric sand shaker, a Todd rumbler and a line of Naab flow torches.

Their showing of supplies included foundry shovels, rammers, bellows, riddles, spoons, draw sticks, wedges, rapping plates and lifters, shell chaplets, perforated chaplets, snap flasks, jackets, bands, sand blast hose, black wax wire.

They kept open house and entertained hundreds of visitors daily.

Peck Iron & Steel Works, Kalamazoo, Mich. A complete line of pressed steel foundry flasks, steel slip jackets and flask bands.

Represented by Wm. W. Peck, pres. and general manager.

It is interesting to note that the Peck pressed steel flask is made from four straight rectangular plates, pressed to form sand-retaining rims and stiffening corrugations, and that these plates are joined at the corner by an acetylene welding process that reinforces the corners with a heavy fillet. This process of manufacture is claimed to contribute to strength and rigidity, and to secure a degree of interchangeability not practical in any bending operation.

Pittsburgh Furnace Co., Milwaukee, Wis. Catalogues, drawing and photographs describing our electric furnaces.

Represented by W. E. Moore, pres.; Edwin Gruhl, vice-pres.; R. C. Gosrow, sales mgr., and E. V. Kane, sales engineer.

This exhibit formed an integral part of that of the General Steel Company described above; and in addition to the photographs of the General Steel Company plant, other Pittsburgh electric steel furnaces shown included a 3-ton unit in both the Sivyer and Maynard steel castings plants in Milwaukee.

Quigley Furnace Specialties Company, Inc., 26 Cortland st., New York. Hytempite furnace cement demonstrated with the use of small high temperature electric furnaces, and insulating brick.

Represented by W. S. Quigley, pres., and L. G. McPhee, sales mgr.

Insulbric kis an extremely light porous brick made from infusoral earth. Its insulating efficiency was demonstrated by operating two small electric laboratory furnaces side-by-side, each equipped with a recording pyrometer for inside temperature and recording thermometer on top. The furnace built from Insulbrix, when heated to 1,800° F. inside, showed an outside temperature of only 210° as contrasted with 290° outside temperature for the silica brick furnace at 1,400° inside temperature.

Hytempite furnace cement was demonstrated to withstand 3,000° F. and bricks made from hytempite and carborundum were exhibited, as were also crucibles coated with hytempite, and samples of cores in which hytempite was used as a wash.

Semet Solvay Company, Syracuse and Detroit. Exhibited Solvay coke, in conjunction with Pickards, Brown & Co., of Chicago, in the form of a General's Headquarters tent designed and built by Geo. A. T. Long, operating metallurgist of the company. The walls were built of foundry size coke and the roof of crushed sizes. An American flag floated from the roof, and flaps to the tent door were made of red, white and blue ropes. In the tent the regulation officer's table bore a war map of the Western front, which was kept up-to-date throughout the convention, and on the back wall was a life-size portrait of General Pershing

The booth was surrounded by a cedar hedge. Altogether, this was one of the most artistically-impressive exhibits in the Arena.

Representing both companies were: James A. Ballard, sales manager and Wm. H. Ball, coke agent, from Syracuse. and by Thomas W. Glasscot, salesman; George A. T. Long, operating metallurgist; Bayard T. Bacon and James A. Galligan, sales agents, from Chicago.

Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. Photographic illustrations of cranes and hoists for foundry use.

Represented by F. A. Hatch, gen. mgr.; R. H. McGredy, sales mgr.; A. J Barnes, adv. mgr., and W. B. Briggs, Chicago district mgr.

W. W. Sly Manufacturing Co., Cleveland, Ohio. Sly horizontal sand blast mill.

Represented by W. C. Sly, pres.; Geo. J. Fanner, vice-pres.; P. W. Graue, western representative; D. E. Hadley, eastern representative, and R. F. Smith, sales representative.

Though this was a still exhibit on the Arena floor instead of an operating exhibit in machinery hall, the big 30-40 horizontal Sly sand blast mill had a constant gallery of interested visitors. In practice it is loaded with castings, forgings, or stampings, much as a tumbling barrel is loaded, and as the barrel revolves, its charge is continuously bombarded with the abrasion from sand blast "guns" at both ends of the barrel. Visitors were shown hundreds of enlarged photographs of Sly installations, the photos being mounted on swinging frames easy of access. Among these were photos and blue-prints of the Sly shell machine in operation at the Goldie-McCullough plant at Galt, Ont., and elsewhere. This machine sand-blast cleans the shells by wholesale, the nozzle rising automatically into the inside of the inverted shells as they pass over it in their revolution on a rotary table. Sand or flint shot are used and recovered for re-use by an air-exhaust and separating system.

Werner G. Smith Company, Cleveland, Ohio. Core oils and cores.

Represented by Werner G. Smith, pres.; M. S. Finley, vice-pres.; F. H. Dodge, mgr. foundry supply dept.; W. E. Rayel, service expert; A. L. Fay, Chicago salesman; L. P. Robinson, Boston salesman, and R. H. Mills, Portland salesman.

Sterling Wheelbarrow Company, 64th and Pullen aves. (West Allis), Milwaukee, Wis. Foundry wheelbarrows, and rolled steel foundry flasks. Some new style flasks will be shown, and also some new barrows including a spring barrow for the handling of cores.

Represented by I. R. Smith, pres., treas. and gen. mgr.; H. H. Baker, sec. and asst. mgr.; J. M. Dickson and R. F. Jordan, factory representatives; J. W. Dopp, Detroit mgr.; C. L Kirk, Pittsburgh agt.; J. J. Coyne, Chicago mgr.; L. J. Salzman, Cleveland mgr.; G. H. Lambkin, New York representative, and E. W. Dowd, New England representative.

Among the Sterling foundry flasks shown were round flasks ranging up to 46-inch diameter and rectangular flasks about 30 by 40 inches. The No. 85 core barrow out-does the gentlest hospital ambulance stretcher for the manner in which all jar and vibration is neutralized by springs.

Sterling flask pins, skim-gates and wedges were also shown.

Frederic B. Stevens, Detroit, Mich. Complete electro plating plant, stamped steel ladle bowls, and new style ladle shanks. A complete exhibit of plumbago parting, foundry facings, etc.

Represented by Frederic B. Stevens, James Hughes, jr., and Henry Krigner.

The ladles were nickel-plated. They included a 100-lb. one-piece stamped steel double-end ladle and a 60-lb hand ladle.

Supplies displayed included wire brushes, plumbago, partings, soapstone, charcoal, graphite, core binders, cotton buffs, felt wheels, Tripoli compound, "Union-maid" white nickel polish, etc., etc.

This booth was a favorite rendezvous for Canadians, among whom Mr. Stevens and his aids are so deservedly popular.

W. F. Stodder, 218 So. Geddes st., Syracuse, N. Y. The cyclone suction sand blast nozzle.

Represented by W. F. Stodder and M. A. Stodder. Mr. Stodder and his sandblast "gun" need no introduction to our readers.

Stuebing Truck Company, Cincinnati. Represented by Walter Stuebing, president, and A. O. Kraemer, western manager. Demonstrated a new model stueing factory lift-truck and showed an interesting library of photographs illustrating the vast time and labor saving accomplished by hauling many classes of products on the line instead of by hoists, A case in point was an installation in a large machine tool plant, where by ending each tool on a raised open-end platform it was ready to be "Stuebinged" then its various steps until it was finally set on the floor of the outgoing freight car. The company's slogan is "Begin to build your factory from the car door."

United Compound Company, 228 Elk street, Buffalo, N. Y. Buffalo brand vent wax, samples of cores which have been vented with this wax, and samples of Buffalo brand pattern wax.

Represented by John W. Bradley, general manager, and William F. Bradley, asst. mgr.

A study of the splendid results secured by wax-venting is all that any coremaker needs to make him a fixed convert to this method.

United States Silica Company, 122 S. Michigan ave., Chicago. Samples of flint shot, sand blast abrasive, and flint silica, steel molding and core sand. Photographs of factories and manufacturing process. Samples of sand-blasted castings. Circulars and other literature about the sand blast process.

Represented by A. Volney Foster, pres.; H. F. Goebig, Oliver Cook and G. M. Flanagan.

Mr. Foster and his staff were around with microscopes with which they showed their visitors the pearl-like roundness and uniformity of flint shot, to explain why this manufactured sand-blast abrasive out-works and out-lasts several times the corresponding volume of natural sand.

The same see-for-yourself demonstration of flint silica molding and core sand was used to support the company's claims for the superiority of this washed, re-washed, steam-dried and screened molding and core material.

Among the circulars distributed were the now famous book, "Little Journeys of the Flint Shot Man," and a new book just off the press, entitled "Some Sandblasting Fallacies." In this latter book Mr. R. R. Shuman, the "Flint Shot Man," with the aid of Dr. Ball, the famous cartoonist, rides over the "sharp-sand" fallacy rough-shod; also showing up the cheap-sand delusion and other fallacies. Both these books will interest and assist everyone who does sand blasting.

F. H. Wheeler Manufacturing Co., 25 East Jackson Blvd., Chicago. Wheeler protective wearing apparel, including asbestos and fire-proofed duck and leather leggings, spats, gloves, mittens, coats, pants, helmets, hand leathers, aprons, etc.

Represented by F. H. Wheeler pres., and E. L. Wheeler, sec. and treas.

This firm is an off-shoot of the old Holcomb-Wheeler Company and Mr. Wheeler and his son are making a strong drive for business, backed by an attractive line of goods.

Whiting Foundry Equipment Company, Harvey, Ill. Tumbling barrel, ladle, truck, turntable, air hoist and drawer type core oven.

Represented by R. H. Bourne, vice-pres. and sales mgr.; N S. Lawrence, asst. sales mgr; A H McDougall, chief engineer; S. T. Sjoberg, asst. chief engineer; G. Schirmer, P. A. Dratz and G. R. Brandon, Chicago representative.

Press of war business prevented this firm from making its usual large working exhibit in machinery hall, among the other power-driven machinery, but its still exhibit in the Arena had no lack of interested attention.

Abell-Howe Co., Chicago.
Abrasive Co., Philadelphia.
Allis-Chalmers Mfg. Co., Milwaukee.
American Gum Products Co., New York.
American Foundry Equipment Co., Cleveland.
American Kron Scale Co., New York.
E. C. Atkins & Co., Indianapolis.
Arcade Mfg. Co., Freeport, Ill.
Asbury Graphite Mills, Asbury, N.J.
Austin Co., Cleveland.
Ayer Lord & Tie Co., Chicago.
Badger-Packard Machinery Co., Milwaukee.
Barrett Co., Chicago.
Beaudry & Co., Boston.
Berkshire Mfg. Co., Cleveland.
S. Birkenstein & Sons, Chicago.
G. S. Blodgett Co., Burlington, Vt.
Blystone Mfg. Co., Cambridge Springs, Pa.
Brass World Publishing Co., New York.
Bristol Machine Tool Co., Bristol, Conn.
Brown Specialty Machinery Co., Chicago.
Buckeye Products Co., Cincinnati.
Bullard Machine Tool Co., Bridgeport, Conn.
Carborundum Co., Niagara Falls, N.Y.
Central Electric Co., Chicago.
Champion Foundry & Machine Co., Chicago.
Frank D. Chase, Chicago.
Chard Lathe Co., New Castle, Ind.
Charles J. Clark, Chicago.
Cincinnati Pulley Machinery Co., Cincinnati.
Cleveland Osborn Mfg. Co., Cleveland.
Cleveland Pneumatic Tool Co., Cleveland.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Thomas E. Coale Lumber Co., Philadelphia.
Combined Supply & Equipment Co., Buffalo.
Corn Products Refining Co., Chicago.
"Daily Iron Trade and Metal Market Report," Cleveland.
Dale-Brewster Machinery Co., Chicago.
Davenport Machine & Foundry Co., Davenport, Iowa.
Davis-Bournonville Co., Chicago.
Dayton Molding Machine Co., Dayton, O.
Deister Concentrator Co., Ft. Wayne, Ind.
Detroit Drill Co., Detroit.
Detroit Steel Products Co., Detroit, Mich.
Dings Magnetic Separator Co., Milwaukee.
Joseph Dixon Crucible Co., Chicago.
R. E. Ellis Engineering Co., Chicago.
Erwin Mfg. Co., Milwaukee.
Federal Foundry Supply Co., Cleveland.
Federal Machinery Sales Co., Chicago.
Foreign Crucibles Co., New York.
"The Foundry," Cleveland.
Foundry Appliance Co., Newark, N.J.
Foundry Equipment Co., Cleveland.
Foundrymen's Supply Co., Milwaukee.
Warren F. Fraser Co., Westboro, Mass.
Garden City Sand Co., Chicago.
General Electric Co., Schenectady, N.Y.
General Steel Co., Milwaukee.
Gooley & Edlund, Cortland, N.Y.
Gordon Sand Co., Conneaut, O.
Great Western Mfg. Co., Leavenworth, Kansas.
Greaves-Klusman Tool Co., Cincinnati.
Grimes Molding Machine Co., Detroit.
Hauck Mfg. Co., Brooklyn, N.Y.
Hausfield Co., Harrison, O.
Hayward Co., New York.
Henry & Wright Mfg. Co., Hartford, Conn.
Herman Pneumatic Machine Co., Pittsburgh.
Hoevel Mfg. Corp., New York.
Holcomb Safety Garment Co., Chicago.
Holland Core Oil Co., Chicago.
Hyatt Roller Bearing Co., New York.
Imperial Brass Mfg. Co., Chicago.
Industrial Electric Furnace Co., Chicago.
International Molding Machine Co., Chicago.
"The Iron Age," New York.
"The Iron Trade Review," Cleveland.
Jennison-Wright Co., Toledo, O.
Chas. Jurack Pattern Works, Milwaukee.
C. C. Kawin Co., Chicago.
Kearney & Trecker Co., Milwaukee.
Spencer, Kellogg & Sons, Buffalo.
Kempsmith Mfg. Co., Milwaukee.
Julius King Optical Co., Chicago.
Laclede-Christy Clay Products Co., St. Louis.

H. M. Lane Co., Detroit.
Loewenthal Co., Chicago.
Lees Bradner Co., Cleveland.
David Lupton's Sons Co., Philadelphia.
Marshall & Huschart Machinery Co., Chicago.
McCrosky Reamer Co., Meadville, Pa.
McLain's System, Milwaukee.
McLain Carter Furnace Co., Wilwaukee.
Mueller Machine Tool Co., Cincinnati.
MacLean Publishing Co., Toronto, Ont.
Macleod Co., Cincinnati.
Magnetic Mfg. Co., Milwaukee.
Mahr Mfg. Co., Minneapolis.
Marden, Orth & Hastings Corp., New York.
"Metal Industry," New York.
Metal & Thermit Corp., New York.
Modern Tool Co., Erie, Pa.
Monarch Engineering & Mfg. Co., Baltimore.
Mumford Molding Machine Co,, Chicago.
Munroe Calculating Machine Co., New York.
Napier Saw Works, Springfield, Mass.
National Engineering Co., Chicago.
New Chicago Crucible Co., Chicago.
Wm. H. Nicholls Co., Brooklyn, N.Y.
Norma Co. of America, New York.
Norton Co., Worcester, Mass.
Oakley Machine Tool Co., Cincinnati.
S. Obermeyer Co., Chicago.
Oesterlein Machine Co., Cincinnati.
Ohio Machine Tool Co., Kenton, O.
Oliver Machinery Co., Grand Rapids, Mich.
Oxyweld Acetylene Co., Chicago.
Pangborn Corp., Hagerstown, Md.
Pawling & Harnischfeger Co., Milwaukee.
Peerless Machine Co., Racine, Wis.
Peck Iron & Steel Works, Kalamazoo, Mich.
Penton Publishing Co., Cleveland.
George F. Pettinos, Philadelphia.
Phoenix Mfg. Co., Eau Claire, Wis.
Picklands, Brown & Co., Chicago.
Pittsburgh Furnace Co., Milwaukee.
Portage Silica Co., Youngstown, O.
Henry E. Pridmore, Chicago.
Progressive Metal & Refinining Co., Milwaukee.
Quigley Furnace Specialties Co., New York.
Racine Tool & Machine Co., Racine, Wis.
Richards-Wilcox Mfg. Co., Aurora, Ill.
Rivett Lathe & Grinder Co., Boston.
Robeson Process Co., New York.
Rogers, Brown & Co., Cincinnati.
Sand Mixing Machine Co., New York.
Schroeter Engineering Co., Chicago.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Simonds Mfg. Co., Fitchburg, Mass.
W. W. Sly Mfg. Co., Cleveland.
R. P. Smith & Sons Co., Chicago.
Werner G. Smith Co., Cleveland
Southworth Machine Tool Co., Portland, Me.
Standard Optical Co., Geneva, N.Y.
The Standard Sand & Machine Co., Cleveland.
Sterling Wheelbarrow Co., Milwaukee.
Frederic B. Stevens, Detroit
W. F. Stodder, Syracuse, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Sullivan Machinery Co., Chicago.
Swan & Finch Co., Chicago.
Thomas Elevator Co., Chicago
Torchweld Equipment Co., Chicago.
United Compound Co., Buffalo.
United States Graphite Co., Saginaw, Mich
U.S. Molding Machine Co., Cleveland.
U.S Melting Furnace Co., Belleville, Ill.
United States Silica Co., Chicago
Wadsworth Core Machine & Equipment Co., Akron, O.
J. D. Wallace & Co., Chicago.
Warner & Swasey Co., Cleveland.
Western Electric Co., New York.
F. H. Wheeler Mfg. Co., Chicago.
Whiting Foundry Equipment Co., Harvey, Ill.
E. J. Woodison Co., Detroit.
Young Bros. Co., Detroit.

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CONTROL OF COOLING IN CASTINGS

By D. STREET

For preventing the difficulties and defects that arise from the uneven contractions of irregular masses of metal for casting, Mr. Cecil Greenhill, Gloucester, has patented a method which depends on the application of electric heat to the thinner and less dense parts of the castings, with the object of keeping their falling temperature the same as those of the thicker and dense parts. As the method of application he suggests casting runners or ribs on the thinnest section and applying heat electrically by dropping electrodes in the molten metal and allowing the preliminary cooling to 1,300 degrees C. to make the joint. In cooling the thinner sections cool more rapidly than the thick ones, but if an electrical current is passed through more heat will be developed in the thinner ones because they have greater electrical resistance than the thicker ones. The amount of current required would not be as large as might appear at first sight, since only losses of heat have to be replaced. It would, therefore, not be anything so great as would be required to heat bodies of metal up to the temperatures at which they are treated, and it would be designed merely to keep the thinnest portions at the same falling temperature as the thickest ones. The method of procedure might be varied so that the current might be used either through the whole range of temperature in cooling or through portions only. In the case of steel it need perhaps be applied only at critical periods of steel formation, say, between 1,300 and 1,050 deg. C., after which the casting might be allowed to cool naturally without harm. Or the casting might be kept at 1,050 deg. and in shapes where the mould could be stripped the mould might be removed and the casting placed in the annealing furnace, thus saving reheating to this temperature for annealing.

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VALUE OF SCRAP IRON

By T. H.

In view of the increasing demand from the steel mills of the country for scrap iron, which demand is said to far exceed the supply, an appeal has been made for a special effort to save all such material. Before the trunk railways of the country were taken over by the Government, the railways were the most important contributors to material of this class used at mills. In many instances it could be delivered cheaply by the railroads themselves, and they have good facilities for its collection. It is said that if all the available iron and steel scrap in the country were marketed there would be no shortage of steel at the mills. Its collection has apparently been somewhat neglected since the Government assumed control of the railroads, but there is no logical reason why such economy should not be practised under Government adcontro of the railroads, but there is no

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NEW APPRENTICESHIP SCHEME

By R. E.

It is to be hoped that more will be heard of the highly interesting scheme of apprenticeship which is being taken in hand by a big London grocery firm. The the old plan of apprenticeship as interpreted in these days has outworn its usefulness is obvious, but it is equally obvious that something must take its place if our commercial ascendancy is to be maintained. This wise and enterprising firm offers to boys who will engage for three years, working six hours, seven hours and eight hours a day respectively, facilities for education at a continuation school in the first year, at the Grocers' Institute in the second, and at one of the best London business colleges for the third year, the firm paying all expenses, and gives wages of six shillings, twelve shillings and eighteen shillings in the three years. The result of this should be that boys who care to apply will be thoroughly outfitted with a sound commercial education side by side with practical knowledge. If some such plan became general in big cities the whole standard of commercial acquirement would be raised to the benefit of both parties and of the State.

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TO PREVENT RUST

Question:—I have a lot of iron patterns and I cannot keep them from rusting. I have been using kerosene oil but it is not very satisfactory and I have heard that brayberry was good. Will you tell me what it is? Where I can get it? and how I am to use it?

Answer:—Excuse me for correcting you. It is not brayberry, but bayberry wax or tallow. It is on sale in the drug stores and is not overly expensive. It requires to be dissolved in benzine and a piece the size of a walnut should be sufficient for about a pint. It does not dissolve readily but should be melted over a slow fire and poured into the benzine and well shaken. When done using the pattern for the day, clean it up with the molder's brush and apply the bayberry wax with a small paint brush and put it away in that condition. When required again, go over it with your pattern brush and it will take a nice polish. This wax is made from the oil which is extracted from the fruit of the bay tree, and is used in the manufacture of wax candles and various wax products. The leaves of the bay tree are used in the manufacture of the flavoring extracts, perfume, and also in the distillation of bay rum.

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DRESSING TARPAULINS

For temporary protection against rain, tarpaulins are largely used, this causing an annual dressing to be necessary. In arranging for this all necessary repairs should be done, and the sheets should be laid out open and thoroughly brushed and cleaned on one side, being afterwards hung up to dry thoroughly. When dry they should be thoroughly dressed on both sides with one of the various dressings sold for the purpose, or they could be done with one made up as follows:—14 lbs good black paint, 1 lb powdered litharge, 2 pints oak varnish, 1 pint boiled linseed oil and 1 pint thick boiled oil, well ground together and passed through a strainer to secure smoothness. After the first coat has dried, the outside of the sheet should have a second coat, the dressing and drying occupying about three weeks in fine weather.—D. S.

FOR THE MAN WHO WORKS IN THE SHOP

FORCING DIRT UP THE RISER A GOOD WAY TO STOP DEFECTS

By F. H. BELL

HAVE in mind a conversation which took place between several moulders, while viewing a large cast iron pipe, which was lying on the floor of the machine shop. This pipe was a nice casting, with the exception of one big dirty spot, which penetrated almost through the entire thickness. We concluded that it was caused through the filling slurey in the joint of the core being washed out and lodging in the spot, although some of it might have been from other sources. The bad spot was only a short distance from a large riser. It was suggested that it would have been nice if it could have been forced up the riser. This suggestion was frowned upon by some of those present, they remarking it could not be done. No one seemed to have a reason, but just felt that it could not be done. The sketch, Fig. 1, is a pipe which molders are frequently called upon to make. It might be a short pipe weighing a few hundred pounds, or it might be several feet in length and weighing several tons. Such a pipe might be seen on a radial drilling machine, or on a pipe threading machine, or down in the bottom of a steam boat, for the shaft to run through on its way to the propellor, outside the boat. Sometimes it will be required to stand pressure, other times it will require to finish clean on the outside, and again it may have to bore out clean. We will presume that we are making one which has to be a fairly good all-round casting. We will suppose that it is 12 feet long, 18 inches outside diameter, and 14 inch bore with a 30 inch flange and weighing approximately a couple of tons. Fig. 2 shows interior of mold with core in place, also gates ready for pouring. It will be observed that it is not level as is the usual way in most foundries. The end which has no flange is six inches lower than the other end, the bottom of this end being on a level with the bottom of the flange. Some molders would condemn it on this account, but have they studied it carefully? There is no more strain on that end than there is on the bottom of the flange, and by having a good riser on top of the flange there is no trouble having sound metal in the top of it. As regards gating, one gate is under the core print, and tight up against it. The other gate is on top of the core print but high enough above it to be in line with the upper extremity of the inside of the mold and pointing in a direction parallel with the mold and core. The pouring basin may be cut down to the dotted line C and both gates be left open, but I prefer to have it built up and plug the gate B with a stopper D, which is just an iron weight with an eye in the top.

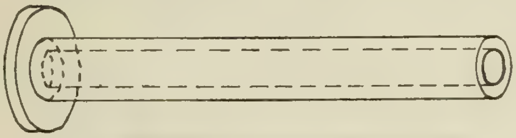


FIG. 1 PIPE WHICH IS TO BE MOULDED.

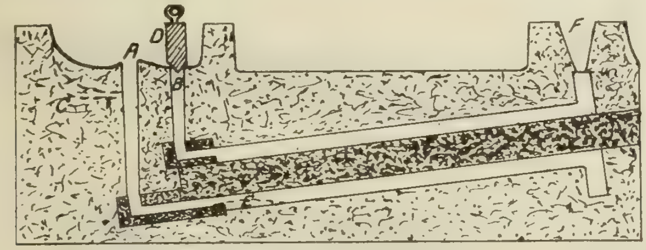


FIG. 2--SECTION THROUGH MOULD FOR PIPE.

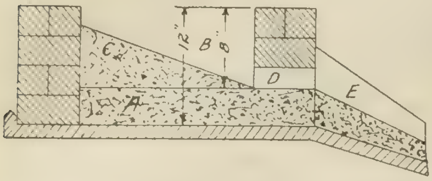
In pouring I start easy in gate A until I have a few pounds in the lower part in front of the gate, see dotted line E, after which I fill the basin but keep the gate B closed. The iron entering through the gate being of the same specific gravity as that which is already in the mold has nothing to change its course and will hug the core the whole length of the mold and any dirt or bubbles which would otherwise have lodged under the core will be forced to keep on the move. When half the metal is poured, that is to say, when the metal in the mold has risen above the largest part of the core, I have the plug withdrawn from the gate B and the iron entering this gate will fall of its own weight and continue to a certain extent to keep things in motion until the core is covered with metal when it will continue its course along the top and carry everything to the riser. If the riser is a fairly large one the dirt should all go up it. A little metal should be flowed through, after which it should be fed with the feeding rod. One riser is all that is required when it is on the highest part.

Even though we have no fear of dirt, there is no better way of molding and pouring a job such as this. Some jobs are gated on the side, but in so doing the metal strikes the core and in splashing back is apt to cut the mold. If the metal is dull it has a better chance running up hill the whole length than if it changes its course from crosswise and spreads in both directions. Disregarding the question of gating it is preferable to have one end above the other because in so doing there is only one place where a shrink is likely to occur, and by having a riser on the spot and feeding it, a sound casting is assured. In pouring any mold with a straight surface, if it is level the metal flows all over at the same time and is apt to show rings and cold shats. If one part is higher than another the lower part will receive all of the metal until it is covered, after which the metal will flow in greater volume over the other parts instead of spreading in a thin layer over a greater surface. Of course, it is best to have good metal, and cores properly jointed, so that these precautions are not so essential, but we cannot always have things just as we wish.

THE PROPER CONSTRUCTION OF THE BOTTOM OF THE CUPOLA

By F. B. BEACH.

THE CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS being an educational journal, I am taking advantage of its pages and sending a little article relating to the sand bottom of the cupola. My object is partly with a view to receiving any education which I can and partly with the wish to educate others, but more than anything else to persuade foundrymen to think and study and not take so much for granted. This particular subject in itself may not amount to so very much, but any subject which causes men to study and arrive at conclusions is of educational value. The generally accepted theory seems to be that the greater the slant of the bottom towards the top hole, the greater will be the force of the metal when tapped. Let us figure this out. Melted iron is a liquid and must be treated as such and in all calculations regarding pressure on molds it is considered as such. According to the laws of hydrostatics, pressure existing anywhere upon a mass of liquid is transmitted undiminished in all directions. All the pressure there is is due to its weight which is approximately a quarter of a pound to the cubic inch, and molders know that this pressure while pressing downward spreads the mold horizontally as well as raising the top off. It is therefore the same as all liquid. Now, as regards the cupola bottom: supposing we have a cupola, a section of which is shown in Fig. 5 with a space of 12 inches from the bottom door to the bottom of the tuyeres and we put in a sand bottom (a) of 4 inches, leaving a space (b) of 8 inches for metal. If this space is filled with liquid iron we will have a pressure of 2 pounds to the square inch at the tap hole. Now, supposing we raise the back of the sand bottom 6 inches as at (c) and give it a gradual slant to the top hold (d) by what means has the pressure been raised above the 2 pounds? Are we to suppose that the iron is going to roll down that hill like so many marbles? Or slide down like a toboggan? If the iron should be confined on the back of this slanting bottom and should be released and nothing should be in the way it would no doubt come down with considerable force. Take for instance the trough (e) outside of the tap hole. The more near perpendicular it is, the more free the metal is to drop down to the ladle, but even then it is the head pressure (b) inside the cupola which is forcing it and when that is drained out the metal going down the grade (e) does not throw itself very far beyond the end of the spout. In my opinion the shape of the bottom has very little to do with the speed at which the metal travels. If we had our city water pipes fed from a reservoir with a slanting bottom, would it increase the pressure at the hydrants? Perhaps my arguments are wrong. If so I would be glad to be educated, but I think there are a great many things believed in connection with foundry work which have never been very carefully considered. I usually make a low bottom if my work is such that I want to have a lot of metal melted at a time. If I am only making small stuff I raise the back to save fuel, but I have to leave the front at the same place always on account of the tap hole. I never see any difference in the force of metal and think it is imagination.



SECTION THROUGH CUPOLA BOTTOM

TAKING ADVANTAGE OF THE LAW OF GRAVITY IN POURING CASTINGS

By M. OLDER

THE matter of melted iron running down hill is a matter worthy of study. It may seem unimportant, but there is more to be taken from it than might be at first thought of. If melted iron is at the top of a hill, and nothing is in its way,it will certainly run to the bottom. But it must be remembered that it will always come to a level, and as soon as the low spots are filled. the remainder of the mold will fill up from one end to the other at the same time, no matter what position the mold is placed in. Supposing we have a mold for a grate bar, shaped similar to the one shown in engraving, Fig. 2, and have it gated at both ends, and have one end elevated a couple of inches above the other, and pour it from the high end at gate (a), the iron will first run to the lowest spot (c) after which it will continue to fill the mold on the level (see lines on engraving.) When the mold is full at the lower end the iron will begin to creep up to the gate (b) and by the time the mold is full and the gate (a) is filled to the top, the gate (b) will also be filled. If it is not it is no use and might as well not be there. Now if the metal will go down gate (a) and fill the mold and then run to the top of gate (b), what would be the difference if we poured it down gate (b) and had it fill the mold and then go up gate (a)? There is no difference. If the metal is so sluggish that it will not do it, it is not fit metal to use, and it would not be apt to run any better from the high end. Molders will say that they have poured them on the level and lost them, and that by raising one end they saved them. I want to say that by pouring them from the lower end they are more likely to run full than if poured with the mold level. The reason is that when one end is raised the slats are filled one at a time and if the mold is level it is a difficult matter to get up the proper pressure to fill all of the slats at once. Any one who has seen pig iron run will see how they overcome this trouble. There is no way but to have the pigs level and to prevent the iron from filling more than one at a time, they have a bod of sand in the end of each one and a man stands with a long pole and removes the bods one at a time. In a mold with a cope on it, the same result is accomplished by raising one end. It has been my experience that any mold is better to not be level, as far as pouring is concerned. Difficult work is kept on the level in order to facilitate the molding, but for plain work this does not count. Take for instance a flat plate. There is nothing more difficult to get a good sound casting off than a plain flat plate. Now supposing we wish to make a casting with a flat face on it of say ten feet square and an inch in thickness, it would appear to be next to nothing to make, but just stop and think it over. Where and how are we going to gate it? If we make it perfectly level, the iron on entering has one hundred square feet of surface to cover, and it will have to travel some if it covers it in time to prevent scabs and cold-shuts. If the gates are dove-tailed so as to spread the iron over the entire surface at once, it will be so thin that it will not have sufficient weight to force the gas downward, and the gas which must escape in some direction will escape in the direction of the least resistance, which will of course be upward, and in doing so will raise the sand on the face of the mold, thus forming scabs and bubbles. If the gates are cut deep and narrow so as to have the metal cover the face of the mold in sufficient volume to prevent scabs, it will remain in separate streams so long that it will be slightly oxidized, and the different streams will not unite perfectly,

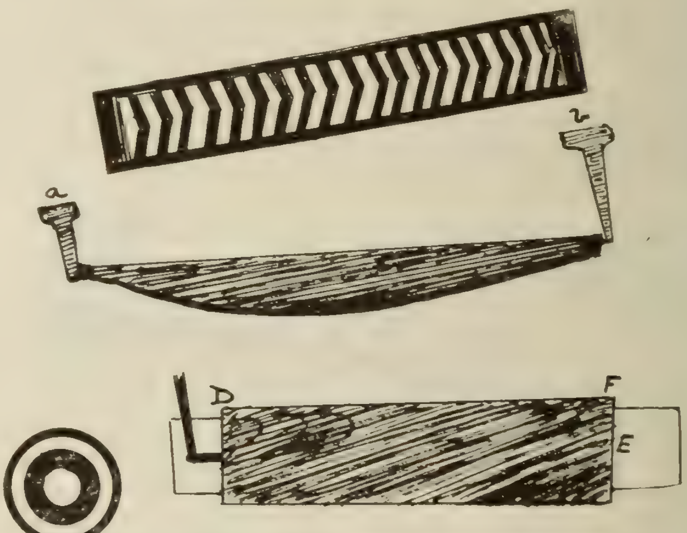


FIG. 1 TOP. FIG. 2 CENTRE. FIG 3—BOTTOM LEFT. FIG. 4—BOTTOM RIGHT.

but will show cold shuts. Now if the mold is elevated on one side and gated on the lowest part with deep narrow gates the metal will cover this part first, and the gates being deep, the incoming metal will not flow over the top, but will flow through what is already there, mixing thoroughly with it, and the whole volume of metal will move in a body and cover the entire face without leaving scars of any kind.

This is not theory, but is actual practice, I always work on this system and have satisfactory results; of course the mold must be properly made in other respects, such as ramming and venting if we expect good results. Take again a mold where part of the pattern is in the cope. As an example of this I have in mind a jacketed cylinder for gasoline engine, with end view similar to Fig. 3. The white centre represent the bore, while the white ring represents the water space. It will be seen that the cylinder, proper, is heavy, to withstand the explosion of the gas, while the water jacket is light, having only to hold water without pressure. A common way of pouring this class of work is to raise one end, and pour from the high end, with a view to forcing the iron into the thin jacket. In Fig. 4 I have endeavored to show how the iron would lie in the mold, as it was being poured and the course it would have to take in order to force itself into the portion of jacket marked D. This of course, is only conjecture and corroberates with the idea of force. If we want to force the metal, wouldn't it be easier to force it from a gate at E so that it could go direct to the point D and depend on gravity to force or draw the metal into F? As it is, it is the last ounce of metal passing through the gate which decides the fate of the point D, and it would certainly require to be a better quality of iron than if poured from E. I am staunch on having metal which will find its way wherever it is required, but if I am compelled to use sluggish iron and depend on force to get it to run, I know that the high spots are the most difficult to reach, and I consider that they are more easily reached by pouring towards them rather than away from them. If a casting is poured in such a position as to leave one part higher than the rest, care must be exercised to prevent it from having the metal drawn from it while the metal is contracting. If it is a light casting this can be overcome by having the gate high enough, but if it is heavy, a suitable feeding head should be provided.

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Will Open Shop.—Messrs. Chambers & McKnight, both experienced men in foundry and machine shop trades have started a brass foundry at 88 River St., Toronto, and in a short time will be equipped to handle all sizes and classes of brass, bronze and aluminium castings.

THE COMPOSITION OF MOLDING SAND

By F. BEACH

ARTIFICIAL moulding sand could be made by mixing the proper ingredients, but we will only speak of sand as we find it in nature. The soil which covers the surface of the earth is composed of two substances; sand and clay, or more properly, silica and alumina. Sand is sometimes found in a comparatively pure state, notably on the sea shore, clay is also found in a comparatively pure state in many places. Loam is the name given to soil which is composed of an admixture of sand and clay. Where a large proportion of the mixture is composed of clay, it is termed clay loam, and where a greater proportion is sand it is termed sandy loam. It is from this last source that we secure moulding sand. But a mixture of pure sand and pure clay is seldom found. If we look at the dictionary for the definition of sand we learn that it is the comminuted fragments of igneous, metamorphic, or volcanic rocks, or of chirt, flint, quartz, etc. They are detached from the parent rock and as boulders and pebbles are ground against each other by the water on sea beaches or in any similar way. If we search further we find that igneous has the meaning of pertaining to fire, while metamorphic refers to the changes which rocks have undergone under the influence of a similar meaning. If we continue our search we learn that chirt is impure flint, while flint is a sub species of quartz, and quartz is pure silex. When we look up silex we learn that it is sand. Like an endless cable this brings us back to where we began. From scientists and geologists we learn the meaning of the original definition of sand. They believe that the world in its early history was a mass of molten rock. In time it cooled off on the surface and no provision being possible to allow of contraction, it cracked in different places permitting the water which had gathered on the surface to come in contact with the still molten interior, causing eruptions which threw out masses of molten rock as well as throwing up mountains of rock which had already solidified. Ages would be required to accomplish this, with the result that we have many different kinds of rock. Rain and frost acting upon these rocks caused them to chip off, and the particles thus loosened were washed down with the streams. The larger and heavier grains settling first, the lighter next, and lastly the mud or silt which would make the water look turbid for a time, but gradually settled down at the bottom and became clay. It will thus be seen that sand and clay both came from the same source but when separated are vastly different from each other. As we have previously said, pure sand and pure clay are not often to be had. If they were we should have an ideal molding sand because all pure silica sand is fire sand and all pure alumina clay is fire clay. It is the foreign material which causes the trouble. Pure silica is white, but sand as we see it is usually colored with oxide of iron or some other mineral and it is such minerals which make it less refractory.

Clay, to use the language of the chemist, is composed of hydrous silicate of aluminum, known as alumina, mixed mechanically with sand and various carbonates, sulphates, pyrites, oxides, and alkaline salts. The different brands of clay found in different clay deposits are only different as regards these foreign substances and not in the alumina. Molding sand will generally consist of about 80 to 85% silica and from 5 to 10% alumina and the balance will be made up of these undesirable foreign substances which act as fluxes and cause the sand to burn on to the casting. It is the rule to select coarse sand for heavy work and finer sand for lighter work but it is equally or more important to have a sand as free as possible from alkali, etc., and if a sand works well as regards its heat resisting qualities, the size of the grain may be overlooked to a considerable extent. The shape of the grain is of much more importance than the size. A smooth round grain makes poor molding sand, the sharper and more ragged it is the better will it hold together and the less clay will it require. The clay binds the individual grains of sand together and the larger the grains the fewer of them there will be to bind together. The lower the percentage of clay the better because the clay closes the pores and prevents the escape of the gas, and as has already been stated, clay usually contains so many foreign minerals which burn on to the casting. It is for these reasons that coarse or large-grained sand is better for heavy work. Heavy pieces will cause more gas to be generated, requiring more easy escape and will also have a greater fluxing effect on the clay.

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The U. S. Liberty Loan.—Aided by President Wilson himself and amid the roar of ten huge sirens and hundreds of factory whistles New York city opened its Fourth Liberty Loan drive to raise $1,800,000,000 of the $6,000,000,000 that will be used to make the world safe for Democracy. Just as the unprecedented noise of the sirens, whistles and church bells ceased the large corporations began going over the top with huge subscriptions. The United States Steel Corporation was the first to send its dollars after the retreating Germans by announcing that it had decided to subscribe $40,000,000 to the Fourth Liberty Loan. This subscription is $15,000,000 in excess of its initial subscription of $25,000,000 to the Third Liberty Loan.

CORE BINDERS AND MAKING GOOD CORES

By F. BELMER

As a core binder, linseed oil undoubtedly has advantages which no other binders possess, also many disadvantages. In these respects it is on a par with all binders. They all have their good and bad features. Some of the compounds which are on the market these last few years are giving good satisfaction and are a great saving in a lot of different ways. For some classes of work, cheap compounds can be mixed with dirt from the gangway, and cores made which have practically no blow or kick to them. They may be left in the sand over night or several nights if need be and take no harm. But still they have their disadvantages. One characteristic of nearly every prepared binder is that it bakes with a crust on the outside, as though all of the binder had been drawn to the surface, leaving the inside all loose sand which can be easily dug out with the fingers. If the core is exactly the right fit so as to require no filing this might be considered an advantage. The inside need cause no anxiety if the outside is all right, but if a core of this kind should require to be filed, it is a difficult matter to do much with it. When all is said and done, and every kind of binder weighed in the balance, and the good and bad in each sorted out, none of them will have much on the "old reliable" which used to be our only binder-flour. Just common wheat flour. Of course it is a crime to waste flour around a foundry these days. We need it for the boys at the front. In the meantime we will have to content ourselves with coal tar or molasses or any other old thing for mixing core sand, or for that matter as a diet. But after the boys have cleaned up on Fritz, and we have more flour than we can eat, it will be as well to know its value in the foundry. It is not so many years back, when sharp sand and flour was the only known composition from which cores could be made, and first-class cores were made from it. Like all of its successors it had its bad features. One of its worst was the smell it used to emit along with the smoke at casting time. And if a batch should be mixed for any length of time before using, the smell would be almost as bad. It was rather a difficult matter to keep to its original shape if made into a core which stood up very high. It had a tendency to sag and spread. Again when a green core was put into the oven and subjected to the heat, the steam thus generated would cause the flour to swell, and instead of contracting as might be expected when the moisture was expelled through evaporation, it would actually expand, and the core when it came out of the oven would be larger than when it went in. All of these points might be considered as bad points but they were not very serious and were overcome with very little difficulty. Some core makers would mix in thin clay wash or a little new molding sand to make it stand up better, and sometimes the foundryman would get stale lager beer from the brewery, and if it was really, real stale it was used to mix the sand with. These little side issues were only meant to improve the flour, but no one ever thought of using anything to replace the flour until the last couple of decades, when attempts were made to find a compound which would make cores both better and cheaper with the results just mentioned.

Binders which cost less than flour would overcome some of the drawbacks in the flour but had other drawbacks instead.

Dry, black compounds with coal tar as the chief constituent make nice cores and leave a good finish on the casting. They are not defected by moisture and will stand the heat of heavy castings. Their main drawback is the poor centre and the difficulty of removing them from the casting. The binder, instead of burning out burns hard. Liquid binders made from the refuse of the sugar mill, make good cores, but have that same drawback. They are not good after the crust is broken. Now to get back to the flour.

If a very small percentage of flour is mixed with any of these binders, and the core sand prepared a couple of days ahead so as to give the water a chance to thoroughly soak into the flour and swell it before the cores are made, a greatly improved quality of cores will be the result. The flour might have a rank smell, but so has nearly everything in the foundry. We have to get used to it. The fresh air will smell all the better when we get outside.

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CINDERS

By T. H.

In view of the fuel shortage, present and prospective, particular importance attaches to cinders. According to an estimate made recently 3.745,000 tons of cinders are either tipped or burned in British municipal destructors every year, and this cinder fuel is equivalent to no less than 2,675.000 tons of coal. Some of the more enlightened local authorities utilize the cinders for steam raising purposes, but the comparative fewness of those bodies may be judged by the fact that this economic use absorbs only about one-eighth of the total quantity of cinders collected by the municipalities, thus leaving the equivalent of 2,226,000 tons of coal absolutely thrown away. London is alleged to be one of the worst offenders, but even in the Metropolis there are a few municipalities which, before the era of fuel rationing, had kept a wary eye on the calorific potentialities of the dustbin. The recovery of cinders, now allowed to go to waste, reckoning coal at 26s a ton means an annual saving of £2,894,000, and on the basis of the 1916 output a year's labor of 11,000 miners. Coal rationing will no doubt stimulate private economies, but it may not have occurred to the authorities that the scarcity and dearness of sieves and sifters militates against private effort in this direction.

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SYMPATHETIC STRIKE FROWNED ON BY LAW

Wider Application of the "No Strike" Order Is Now Under Consideration

Ottawa.—Wider application of the no-strike order-in-council is understood to be under consideration. Prosecutions so far in Calgary have been taken under the provisions of the Industrial Disputes Investigation Act, which provides penalties for men engaged in certain industries who strike without first applying for a board of conciliation. This course was taken because there was doubt whether the original strike was declared before the no-strike order was approved by the Governor-General.

But, it is pointed out here, sympathetic strikes are in a different category. Any declared since the approval of the order come under its provisions. Not only are the penalties heavier which may be imposed by the civil courts, but the order contains a work or fight provision which may be put into effect. In scope, it goes farther than present applications of the Military Service Act. No married men have been called to the colors under the Military Service Act. The work or fight provision includes all men of military age, whether married or single.

"Any male person, employer or employee of military age as defined by the Military Service Act," reads the provision, "who violates any of the hereinabove enacted regulations and any director of such military age of any company who acquiesces in the violation by the said company by any of said regulations, shall ipso facto be deemed to be a soldier enlisted in the military of Canada and subject to military law for the duration of the present war, and of demobilization thereafter and shall forfeit any exemption granted to him and any right to apply for or obtain any exemption from military service under the Military Service Act."

It is emphasized that there is no desire to cause undue hardship by rigid application of the order-in-council, and hope is expressed that satisfactory settlement will be reached before such a course is rendered necessary.

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His Excuse

It was the middle of the week when the young man appeared at the office to make his excuses and explanations.

"You should have returned from your vacation last Monday, sir," said his employer. "You were having a good time at that summer resort, I suppose, and thought you were entitled to three days of grace."

"N-not exactly," stammered the young man, with heightened color. "Laura, sir."

Bettering the Quality of Foundry Sand Mixtures

Investigations Were Undertaken to Determine the Mixtures of Old and New Sand Best Adapted to Producing Good Castings—The Author, in a Paper Read Before the American Foundryman's Association at Milwaukee, Points Out the Results Obtained in His Investigations

By HENRY B. HANLEY

IN THESE times it is, of course, exceedingly important to reduce the cost of foundry sand mixtures, not only by decreasing the amount of new sand used but also by increasing the quantity of old sand that can be used over again.

Sand preparation has only recently received the attention that it deserves, probably because other problems occupied the attention of the foundrymen and were considered more important from the standpoint of the quality of the castings and the cost of production. Different methods of molding mixtures of metal for various weights of castings and for castings for different purposes has occupied the attention of the foundrymen to the exclusion of the now considered important sand mixing department.

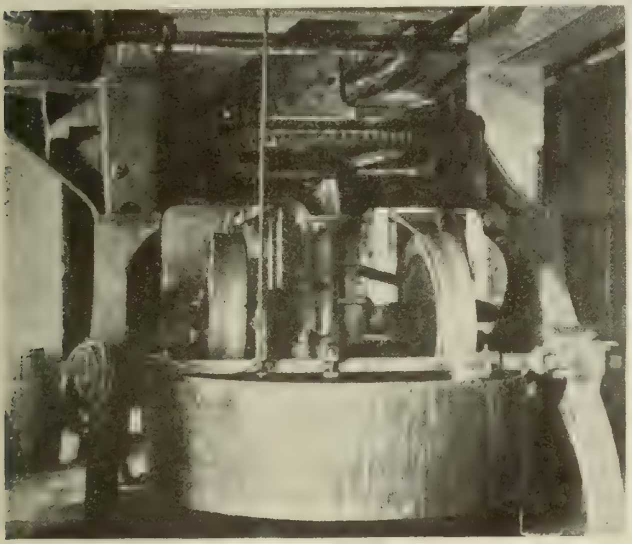
FIG. 1- SAND MIXING MACHINE OF THE MULLER TYPE.

There is no doubt that ultimately ways and means will be found to use up all of the old sand; also that the old cores will be broken up and used over again. Furthermore, unless the foundry is so small that it cannot afford the expense it is absolutely necessary to employ a metallurgist or chemist to experiment with the different kinds of new sand to investigate the possible reduction of binder for core sand with the use of cheaper binder than was formerly used, and generally to supervise the more thorough and more economical preparation of molding sands.

It is believed by many engineers who have studied the subject that the most satisfactory means of mixing is by the use of a muller type of machine, provided that the mulling action does not destroy the original structure of the sand, but simply incorporates the various ingredients into a uniform mixture, at the same time maintaining its original porosity.

Locating the Mixing Department

It is important properly to locate the sand mixing department so that the new sand can be delivered as automatically as possible into the mixing machine, and to take away the resultant mixture quickly and economically, thus securing the maximum capacity from the mixer. Also, where one machine is used for both facing and core sand, it should be located so that the core mixture and the facing mixture can be used in the foundry with as little delay and expense as possible. Likewise, the transported to wherever they are to be return of the old sand sand to the machine should be kept in mind, so that the expense of so doing will not counteract the advantage of using up the old sand. It is important that the sand be distributed so that the molders will not have to wait at any time for a fresh supply of sand.

Hand mixing is absolutely a thing of the past, not only on acount of the labor conditions at the present time, but also because of the reduction in cost, as obviously it is impossible to reduce the quantity of sand that is required, by hand mixing, as can be done mechanically.

Accurate records should be kept of various mixtures required for certain classes of work and the cost of such castings. In other words, the cheapest mixture that can be used in any particular class of work should always be determined, and then this particular mixture should be absolutely maintained.

Time of Mixing

The time of mixing should be very carefully investigated, as in core sand especially it is just as bad to mix the sand too long as not long enough, as more expense is necessary in continuing the mix beyond the time required. I have heard a great many foundrymen make the statement that poor sand preparation is responsible for more lost castings than any other cause.

It is also possible with the muller type of mixer to secure a good distribution of sea coal particles for facing, and to decrease the amount of sea coal that is required. Consider the immense saving in time effected by the molder in finishing the mold that is made with well mixed sand; the mold will not fall to pieces so easily and therefore requires less finishing. The metal will not cut into the mold because the sand presents a tougher exterior. It is not difficult to note the difference, by observation in the cores of the rough,

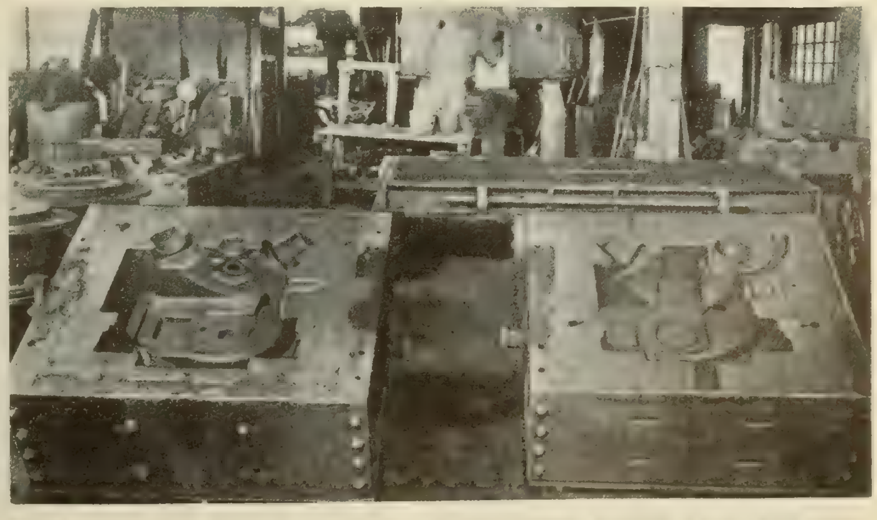
FIG. 2—CYLINDER HEAD MOLD IN WHICH RECLAIMED FACING SAND WAS USED.

loose edges where the sand is not properly mixed. These edges, of course, are liable to wash off and the pieces get to the top of the casting and cause endless trouble in the machine shop, resulting in the scrapping of the castings.

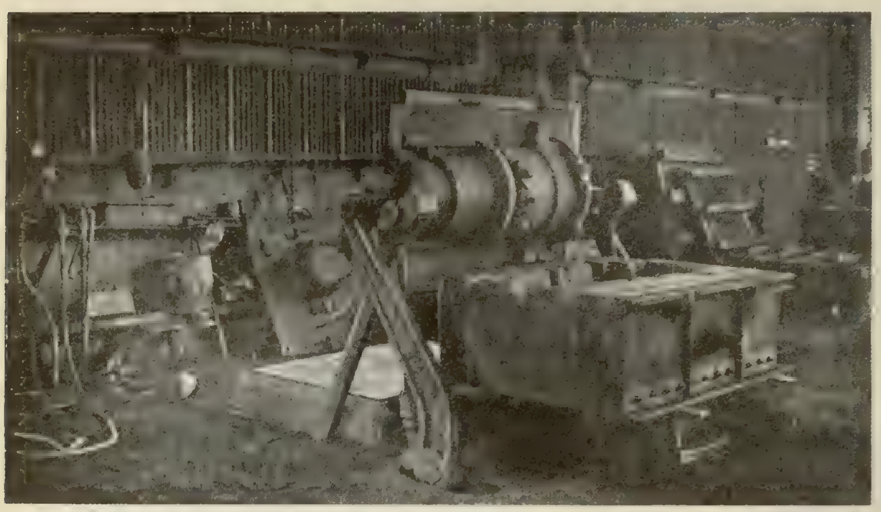
FIG. 3—METHOD OF MOLDING WITH IMPROVED AND RECLAIMED SAND.

Where a foundry uses mostly green sand it is all the more important to prepare it properly especially where there is a variety of castings of both heavy and medium weight. In such cases mixtures of sand can be produced with small additions of binder and sea coal that are quite economical. On the other hand, mixtures are required with much stronger bond and more careful manipulation. It is oftentimes desirable to arrange for various bins for the different mixtures, so that there is no chance of using a mixture that is not adapted to the particular class of work to be done.

Another valuable use of the sand-mixing machine is that very tough sand can be cheaply made for large copes because less sea coal is needed and the cope part of the mold is not apt to scab; also the cope is much less liable to drop out, as is often the case with poor facings.

Description of Equipment

Fig. 1 shows a large cylindrical pan 7 feet in diameter, with sides 12 inches in height. The mullers are supported on steel shafts which are independent of each other. The ends of these shafts are provided with shoes which move in guides in the frame. The muller shafts are supported by heavy steel springs which may be set in such a position that the mullers are close to but not in contact with the muller plates when the pan is empty. The space between the mullers and the muller plates can be adjusted to suit the blending requirements. A mechanical unloader permits of emptying the machine while running.

In our experience with the muller type of sand machine, we found it important to make a careful adjustment of the mullers so that they do not rest on the pan. In this way there is little danger of grinding the material to a powder. On the other hand, if the muller is in contact with the pan a continuous grinding goes on which is harmful for any sand. In the first place, the grain size and grade of the mixture is altered and the whole mass is broken into fine, sharp particles. When such sand is dumped out, it does not feel right, is weak and very sharp. With proper attention to the position of the muller excellent sand can be obtained at all times in not exceeding five minutes time of mulling. This will give the maximum bond for the mixture used. Mulling for three minutes will give all times in not exceeding five minutes' The ultimate bond is dependent on the mixture used, the temper, the revolutions per minute and the time.

Influence of Additions of Sea Coal

While conducting a number of tests on green sand facings that contained sea coal, we were surprised to find that the sea coal had a serious effect on the bond. Tests were made to determine to what extent sea coal could be used in good facing and still have the bond required for safe working. A mixture was made of old sand 60 per cent. and new sand 40 per cent., no sea coal being used. The molds were blacked, and the casting came out fine. Next, 3, 6 and 9 per cent. additions of sea coal were tried. On passing 6 per cent. the bond was so seriously weakened that quite poor castings were produced. All of these mixtures were prepared in the muller previously described and were mixed in five minutes' mulling. After a careful investigation, it was learned that the sea coal breaks up the continuity of the bond imparted by clay or impurities. This weakness attributed to sea coal could easily have been overcome by additions of more new sand, but since this means increased cost for facing it was decided to adopt the safe working limit of 6 per cent. for facing intended for medium weight castings.

Reclaiming Old Sands

In selecting molding sands, we have tried to secure strong bond sands at all times. We find there is economy in the purchase of these strong bond sands because they will go further than a sand of weak bond in adding to old sand or in making a facing. One can appreciate the effect of adding 10 per cent. of extra strong stove plate sand to the heap sand, when to begin with the stove plate sand selected for this work contains double the bond of other sands. There are some advantages about reclaiming old sands with strong bond new sands, that should appeal to those who do not have a muller. It is not so difficult to mix thoroughly the two sands as it is when the mixture of clay is undertaken.

To make clear the influence of selected strong bond sands for reclaiming purposes, our experience has been that they are economical and safe in plants where there are no means of controlling the reclamation work, such as tests that show exactly what the bond and other qualities are.

Reclaiming Sand With Ordinary Fire Clay

We have found that fire clay is not suited to molding sand work for the

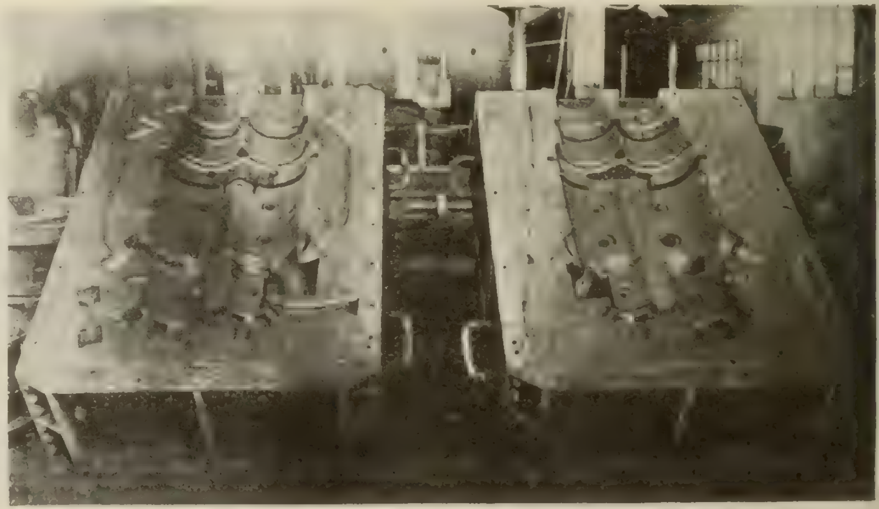
FIG. 4 AIR COMPRESSOR CYLINDER MOLD.

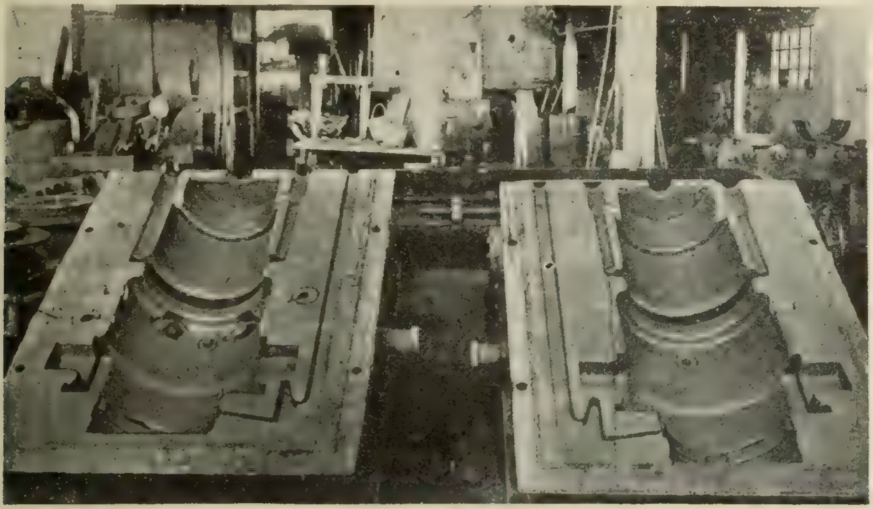

FIG. 5—WORKING CYLINDER MOLD IN WHICH RECLAIMED SAND WAS USED.

simple reason that it takes too much clay to develop the bond when added to old sand. The reason for this is the fact that fire clay does not possess any amount of plasticity but is generally nonplastic. We have found additions of 10 per cent. fire clay a serious detriment in sands intended for facing, because with the clay in the old sand plus the added clay which made a total of 20 per cent., troubles in venting and blowing developed. On cutting the fireclay addition down to 5 per cent.. the troubles were eliminated, but the bond was not reliable. If the molds dried out from long standing the cope would drop from weak bond. When mullers were first introduced for sand reclamation, it was thought possible to take any foundry clay, add old sand, and make new molding sand. This idea is disappearing because the knowledge of clay to-day shows that there is a great variety to select from, each having a different bond and plasticity. Excellent results are obtained when the proper clay is chosen for the work, as the following table indicates:

Bond absorption figure—Ordinary fireclay, 2,000; selected plastic clay, 12,000.

Transverse strength—Ordinary fireclay, 15 pounds per sq. in.; selected plastic clay, 275 pounds per sq. in.

Clay substance plus impurities, per cent.—Ordinary fireclay, 96 per cent.; selected plastic clay, 98 per cent.

In selecting the clay to be used, a strong bond plastic clay should be specified. As the table shows, practically the same amount of clay is used, but its quality and its influence on the ultimate strength or bond of the sand being reclaimed will differ enormously. This has been explained previously and is due to the superior physical quality and not the chemical quality of the selected plastic clay.

Reclaiming Sand with Selected Plastic Clay

When one changes from the use of ordinary fireclay to a strong plastic clay and attempts to rejuvenate the old sand, an entirely different result is obtained. With the plastic clay, a good strong bond that is reliable is secured. Only a small amount, 5 per cent. or sometimes less, is required to develop an excellent feeling in the worn-out sand. This is a tempting line of investigation because it offers a considerable return, on account of the great economy possible. Backing sand for heavy work needs nothing more than a small amount of plastic clay and a few minutes in the muller. When one considers the vast difference in properties of clay that are suitable for this line of work, it is easily understood that the future advances will be made not by using the ordinary fireclay but the selected plastic clay.

Method of Adding Clay to Sand Mixtures

It is still a matter of argument between foundrymen as to the best way to blend sands in order to get the best results. Some prefer the dry method and then tempering; others prefer to mix and temper at the same time. Our experience has shown that wet mixing in a muller develops about all we expect from the ingredients. We have had the best results by adding clay in the form of emulsion while the machine is in operation. This allows the clay to spread over the surfaces and avoids lumps in the mixture. It is entirely a matter of clay dispersion over the sand surfaces that makes ultimate bond. We all know that a liquid condition for the added material is superior to the dry condition. By mixing the clay with water we can develop the maximum amount of bond with the minimum amount of clay.

Utilization of Local Sand

When we have a muller at our disposal, we find that it is thoroughly practicable to utilize some of our local sands by adding 25 per cent. to our new facing sand mixtures. In this way we are saving 50 to 75 per cent. against the cost of new molding sand brought from long distances. A good mixture for medium weight castings can be prepared in a muller by taking 50 per cent. old sand, 25 per cent. local sand, 23 per cent. of new sand and 2 per cent. of selected plastic clay. It is of importance, however, to first know that the local sand is of refractory character. It matters not whether it contains clay or other bond; this can be put into the mixture at will.

Quality of Work with Reclaimed Sand

The quality of the work produced is the main consideration in sand reclamation. The results obtained so far are decidedly in favor of mechanical treatment of the sand. When a mixture is found satisfactory for a certain line of work it can be duplicated, thereby giving each molder the same quality of sand. This avoids the personal equation where each man thinks he is better prepared on his own facing requirements than the next one. We have seen hundreds of important castings come exactly the same in surface appearance day after day. They were not made from exactly the same formula for sands but the texture and bond were what was required for the job. In order to have complicated castings free from sand defects it is necessary to give the sand mixing some study.

Figs. 2, 3, 4 and 5 show a variety of dry sand molds in which we have successfully employed improved and reclaimed facing sand. The molds are for Diesel engine castings.

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CANADA'S SEA CONNECTIONS

By M. M.

In view of the progress now being made in Canada with the shipbuilding industry, more enterprise is being shown there than in any other part of the Empire. It is of interest to hear that important negotiations are taking place for a big development of shipping services between this country and the Dominion. Much, however, depends upon the settlement of the railway question which Sir Robert Borden has in hand, and with which it is understood he has made good headway since his visit to London in connection with the Imperial Conference. The Cunard Line is one of the companies vitally interested, as over a year ago it arrived at a working arrangement with the Canadian Northern Railway for an expansion of the country's overseas commerce, both on the Atlantic and the Pacific; and is naturally being held back pending an agreement between the various parties concerned. Another question to which it is said Sir Robt. Borden is to give prompt attention is the report of the Quebec Board of Trade for a prolongation of navigation on the St. Lawrence, between that port and the sea, throughout the year. If carried out, there is no doubt that the recommendations of the committee will make navigation on that river easier, but until an improvement is reflected in underwriters' statistics there can, be no possible reduction in premiums.

RECORD SYSTEM FOR PATTERNS

By Wilfred G. Astle

The following system of keeping a record of patterns, also indexing and storing them, will eliminate any delay or errors made in selecting the proper patterns from the store-room, and has been successfully used in the shops of a large electric railway system in Indiana.

Requisition

The first form required is a requisition (Illustration No. 1) and is issued by the foremen of the different departments when patterns are required from the storeroom. This requisition is first approved by the master mechanic, and is then turned over to the pattern storekeeper, who supplies the pattern. If the pattern is a new one and has to be made up, the requisition is then turned over to the foreman of the pattern shop, and is his authority to make up the pattern. When the work is completed he forwards the pattern to the pattern storekeeper accompanied by a pattern report (illustration No. 2).

Office Record

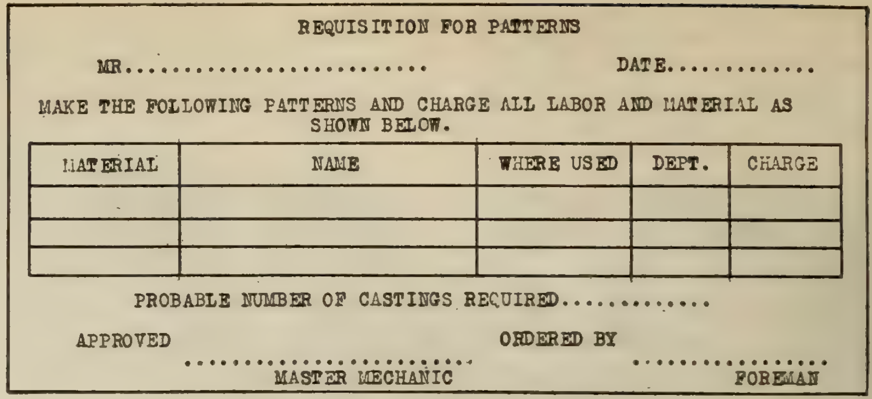
The office record is shown Form No. 3 (see illustration) and contains details of the make-up of the pattern and the metal from which the casting should be made and the approximate weight of one casting. This form also shows the location of the pattern at all times. In order to make this record complete, it will be necessary to arrange the pattern shelves so that they can be divided by partitions and numbered. Each pattern is given an index number which will correspond to the correct name.

Tag for Outside Work

When it is necessary to send any pattern to an outside foundry for castings, a special tag is used (Illustration No. 4) which consists of three coupons, and is fastened to the pattern. When the pattern is ready for delivery the first coupon is detached by the pattern storekeeper, and forms a record of the pattern sent as well as the name of the party receiving it, the date of delivery, and the name of the department ordering it sent.

The second coupon is detached by the foundry receiving it, and requests that the foundry check the number of pieces according to the memorandum attached on the third coupon, and that it receipt for the pattern on delivery.

The last coupon remains with the pattern and is a correct record of the type, number of parts and number of core boxes as well as the correct name and the material to be employed in the casting. The first coupon, which is detached by the pattern storekeeper, is kept in his office and the record that it contains is copied on the permanent office record.



REQUISITION FOR PATTERNS

MR........................ DATE............

MAKE THE FOLLOWING PATTERNS AND CHARGE ALL LABOR AND MATERIAL AS SHOWN BELOW.

MATERIAL	NAME	WHERE USED	DEPT.	CHARGE

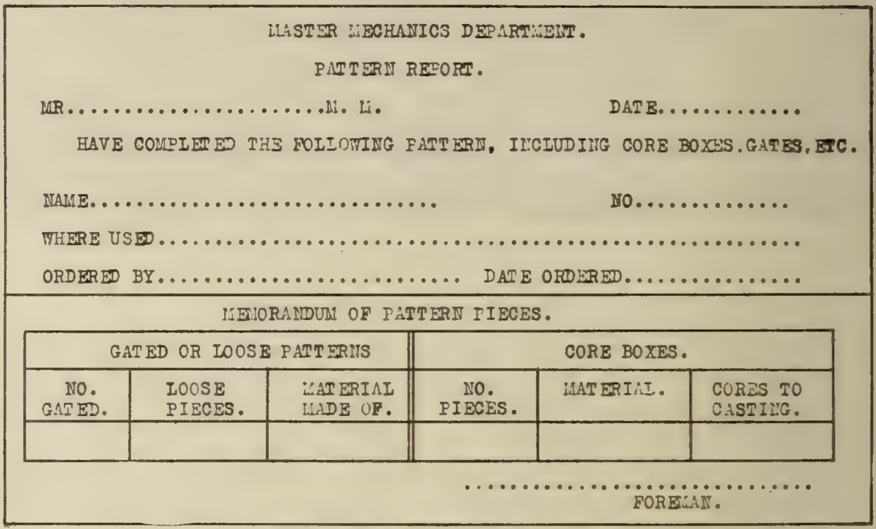
PROBABLE NUMBER OF CASTINGS REQUIRED............

APPROVED ORDERED BY

.... MASTER MECHANIC

.... FOREMAN

FORM No. 1—SHOWING REQUISITION FOR PATTERNS



MASTER MECHANICS DEPARTMENT.

PATTERN REPORT.

MR.....................M. M. DATE............

HAVE COMPLETED THE FOLLOWING PATTERN, INCLUDING CORE BOXES.GATES,ETC.

NAME............................ NO.............

WHERE USED..

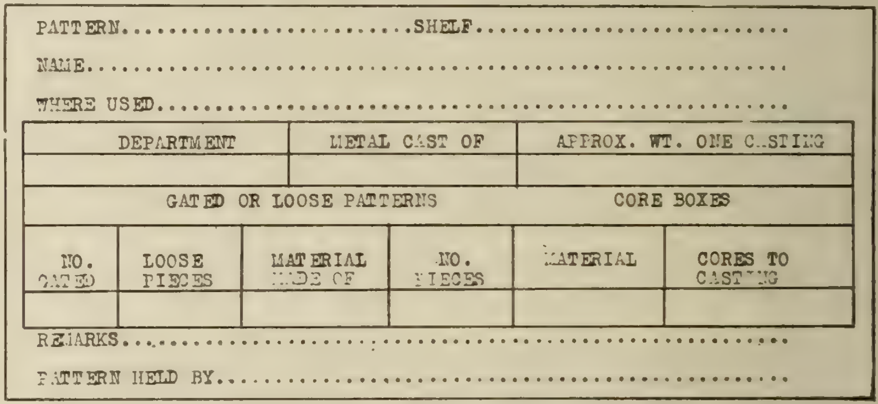
ORDERED BY........................ DATE ORDERED...............

MEMORANDUM OF PATTERN PIECES.

GATED OR LOOSE PATTERNS			CORE BOXES.		
NO. GATED.	LOOSE PIECES.	MATERIAL MADE OF.	NO. PIECES.	MATERIAL.	CORES TO CASTING.

.... FOREMAN.

FORM No. 2—SHOWING PATTERN FOREMAN'S REPORT



PATTERN......................SHELF.........................

NAME...

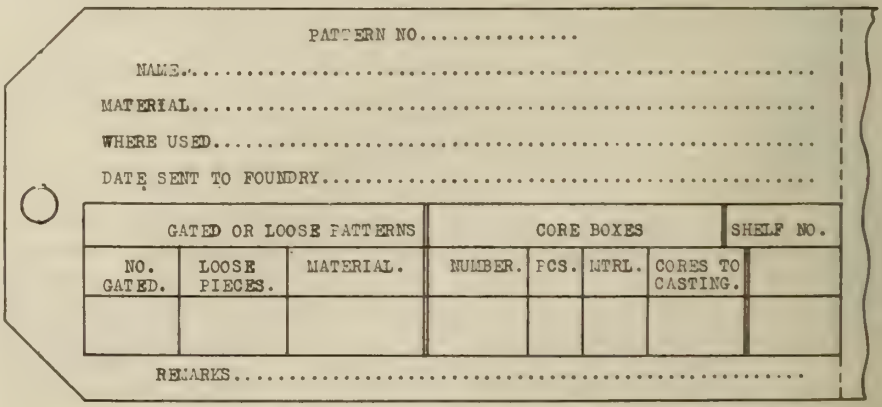
WHERE USED...

DEPARTMENT		METAL CAST OF		APPROX. WT. ONE CASTING	
GATED OR LOOSE PATTERNS			CORE BOXES		
NO. GATED	LOOSE PIECES	MATERIAL MADE OF	NO. PIECES	MATERIAL	CORES TO CASTING

REMARKS..

PATTERN HELD BY..

FORM No. 3—SHOWING OFFICE RECORD OF PATTERNS



PATTERN NO...............

NAME...

MATERIAL...

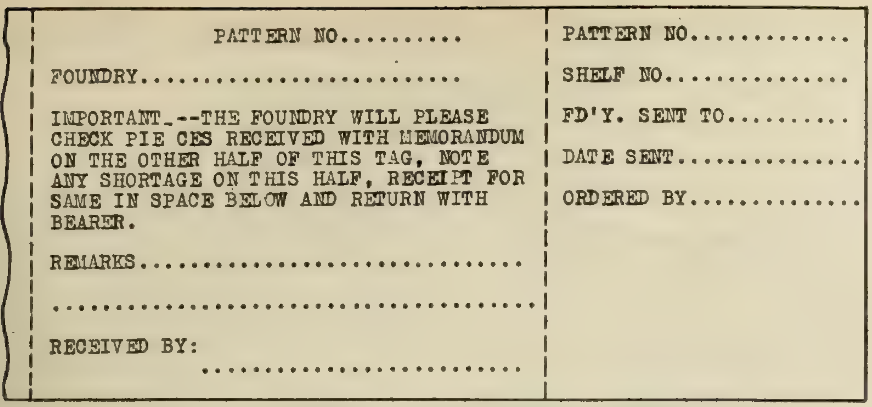
WHERE USED...

DATE SENT TO FOUNDRY.......................................

GATED OR LOOSE PATTERNS			CORE BOXES				SHELF NO.
NO. GATED.	LOOSE PIECES.	MATERIAL.	NUMBER.	PCS.	MTRL.	CORES TO CASTING.	

REMARKS..

FORM No. 4—SHOWING MAIN PORTION OF SPECIAL COUPON TAG



PATTERN NO..........

FOUNDRY.........................

IMPORTANT_--THE FOUNDRY WILL PLEASE CHECK PIECES RECEIVED WITH MEMORANDUM ON THE OTHER HALF OF THIS TAG, NOTE ANY SHORTAGE ON THIS HALF, RECEIPT FOR SAME IN SPACE BELOW AND RETURN WITH BEARER.

REMARKS...............................

....

RECEIVED BY:
....

PATTERN NO............

SHELF NO..............

FD'Y. SENT TO.........

DATE SENT..............

ORDERED BY.............

FORM No. 4—SHOWING COUPON PORTION OF SPECIAL TAG

FRICTION AND LUBRICATION

By D. Street

The experimental results obtained by such well-known authorities as Stribeck, Heimann, Beauchamp, Tower and others prove that the view commonly held, that the length of a bearing should increase in proportion to the speed, is wrong; and that some modern methods of automatic and forced lubrication are essentially faulty. In the case in which one solid substance is rubbed, on another without the intervention of any unguent, it is well known that however smooth a metallic surface may appear to the eye or touch, its real condition when looked at under a microscope resembles that of a very rugged mountain system; the peaks and chasms on the two surfaces crash into each other whenever there is any relative movement between them. The molecules are also assumed to be in a state of constant vibration.

No one would expect that any regular system of laws could be deduced from such a process, as a complete molecular theory of matter would be required to rationalize these phenomena; nevertheless, certain rough generalizations could, however, be made, which are useful to the engineer; namely, that the co-efficient of friction increases with the load, that it varies with the speed of rubbing, being greatest when the motion is slowest, until, at the point where one body is just commencing to move relatively to another, a maximum is reached. The friction at this point has been cleverly called "striction" and has been investigated by a well-known expert, Rennie, who succeeded in obtaining values as high as 0.3 to 0.4 for the co-efficient of striction for iron upon iron.

In the ordinary case of a greasy shaft lying in its bearings at rest, if it be assumed that the shaft be of smaller diameter than the brass bush, it would only touch it along a narrow line at its lowest point. As soon as rotation begins, the shaft no longer remains on the bottom of the bush, but rolls up the slope in a direction contrary to that of rotation and the point of contact changes according to the speed of the load. As the former increases, the oil will necessarily be carried round with the shaft until it forms a film separating it completely from the brass bush. The pressure is greatest immediately in front of the point of nearest approach between the shaft and the bush, and falls to nothing immediately that point is passed, maintaining a constant pressure through the remainder of the bearing. At still greater speeds it has been ascertained that the maximum oil pressure diminishes and that the shaft takes up a more central position in the bearing. If the speed were infinitely great, the shaft would run quite centrally in the bush and the positions of maximum fluid pressure would be vertically about and below the centre.

The important physical results of these observations are that they enable engineers to determine upon the best position in the circumference of the bearings at which the lubricant ought to be applied. With ordinary automatic lubrication by cup and syphon, or by ring, or centrifugal method of supply, the oil should obviously be made to flow on to the journal where pressure is least, that is to say, the oil should be fed from a point situated in the top rear quadrant of the bearing when the shaft is loaded by gravity only, and the point should be further back the slower the speed becomes. When the lubricant is supplied under pressure by mechanical means, it must be fed in at the points of greatest oil pressure, in the bearing. In engine bearings fitted witth forced lubrication this has been found not to be usually done by the makers who did not threfore get the full advantage of the system.

The next point is a description of the nature and magnitude of the frictional resistance set up between the shaft and the bearing when there is an abundant supply of lubricant completely separating the two, thus preventing any metal to metal contact. In this case friction is due to the resistance of the oil to shearing or transverse distortion. With a film of oil of uniform thickness this friction depends only on the area of oil to be sheared, the viscosity of the oil, its temperature and the thickness of the film. Unfortunately there are very few cases in engineering practice where a shaft rotates at such a speed as would insure a uniform thickness of oil all round. In the case of turbines, motors and mill spindles this may happen, but in most cases the shaft moves to one side by an amount which depends on the speed and on the load.

With a film of uniform thickness the friction becomes less as the thickness of the film increases, and it would appear that in the case of a shaft rotating eccentrically in its bush, the increased thickness on one side must compensate for the thinning on the other side. This, however, is not the case, for it has been found from the Researches of Professor Osborne Reynolds, of Owen's College, and Mr. Sommerfield, another expert, that what is lost in friction due to thinning on one side is greater than what is gained by the thickening of the oil film on the other side. On the whole, therefore, the friction may be said to be increased by the eccentricity of the shaft in the bearing. Any increase of speed tends to reduce this eccentricity of the shaft and as a consequence to reduce the friction. On the other hand, as the speed increases, the oil resistance increases. There can be no doubt that the greater the pressure on the bearing, the greater the speed is at which the co-efficient of friction has a minimum value. The conclusions which may be drawn are that the ordinary assumption of a constant co-efficient of friction is incorrect and that, as a matter of experimental fact, it has been proved to be by no means constant but dependent on speed pressure and on temperature.

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PURE SHEET-NICKEL

Pure nickel should not be confounded with the inferior metals usually sold as nickel, which consist mostly of steel, brass or German silver with a thin plating of nickel. Nickel is essentially an American product. For many years it has been a general practice to have the ore which has been mined in this country and Canada reduced to its various forms by European manufacturers. Previous to the war most of the material imported into this country as foreign stock was the American metal worked into the form of sheet, strip, and finished articles of manufacture by foreign concerns.

While not so good a heat conductor as aluminum, nickel utensils are made of a thinner material, which more than overcomes the difference. Pure nickel has a melting-point of abut 2,600° F., whereas aluminum has only one of about 1,200°. There is not the same possibility of softening under constant use. The metal is also much more resistant to the action of the acids commonly found in food products. The silver-like appearance of pure nickel does not change in use.

In the chemical field there are many uses for this metal. The surface of pure nickel is not attacked by acids nor alkalies, in the dilute form usually encountered in ordinary service. In fact, it is practically immune to the attacks of all alkalies, regardless of their strength, and is largely resistant to the action of most acids. Nickel has a high tensile strength, and in the sheet form, being homogeneous throughout, is ductile and easily formed by spinning or stamping. No special equipment is necessary for manufacturing articles from these sheets, the same tools and metals being employed as with German silver and hard alloys.—The Journ-Franklin Inst.

Semi-Steel Shell Feature of Convention Week

Much Progress Already Made — Large Orders to be Placed — French Practice — Methods of Casting

THE use of semi-steel for shells, gas and smoke bombs undoubtedly was the source of most interest at the American Foundrymen's Convention held at Milwaukee Oct. 7 to 11. The fact that Great Britain, France and Italy are already far advanced in the use of this material places its use beyond the experimental stage and the intention of the U. S. Government to place large orders for semi-steel shells of various sizes gave a very practical emphasis to the discussions which occurred.

The session at which the scope and character of the ordnance department plans were disclosed was marked by the largest attendance of the entire convention week.

The Semi-Steel Shell

This subject was reserved for a special session on Thursday afternoon, opened by Capt. H. M. Huxley, engineering division, ordnance department, Washington.

Captain Huxley said the Government expects to order several million semi-steel shell ranging from 75 to 240-millimeters, or from about 3 inches to 9½ inches in diameter. The necessity for extreme care in the manufacture of semi-steel projectiles was emphasized by Captain Huxley and the grave results which may follow the failure of a single shell were pointed out, for if but one shell burst in a gun, it was likely to kill the crew and would also have a bad effect on the morale of the gun crews.

As is well known semi-steel consisted of 30 per cent. scrap. The engineering division of the Ordnance Department has formulated designs for shells ranging in diameter from 75 mm. to 240 mm. (approximately 9½ inches).

French Practice

The French technical mission was represented at the meeting by Captain Guillemin and Lieuts. Laurent and Blanchet Lieut. Laurent read an address dealing with the metallurgy of semi-steel shell in which he said that in French practice the electric furnace or cupola is used for melting. The history of the semi-steel shell was briefly traced. The superior fragmentation of semi-steel as compared with cast iron was pointed out.

The following physical requirements have to be met:

Tensile strength, 35,550 pounds per square inch, the tests being made with bars 0.63 inch in diameter.

The elastic limit varies, but 14,000 pounds per square inch, on a bar 0.63 inch was recommended. Crushing strength should be over 142,200 pounds per square inch. The transverse strength should be equal to 1,422 pounds per square inch on a test bar 2.56 inches long by 0.39 inch square. The Brinell test must give a diameter of impression approximate to 4.25 mm., with a ball of 10 mm. and a pressure of 3,000 kg. within 30 seconds.

Convention Briefs

Officers elected for the coming year.

President A. O. Backert, Penton Publishing Co., Cleveland.

Vice-President, W. A. Janssen, Canadian Steel Foundries, Ltd., Montreal, Que.

Secretary-Treasurer, C. E. Hoyt, manager of the exhibition of the association.

A total registration of 2,800 was obtained as compared with 2,300 a year ago.

Semi-Steel in shell manufacture aroused great interest and large quantities are to be used by the U. S. Government for gas and smoke screen uses. Trench technique explained by Lieut. Laurent.

Improvements in design of equipment, buildings and better foundry organization, were featured by the various papers read before the Gray Iron Session.

Valuable papers were read before the malleable iron section, treating of late developments in metallurgy and outlining the future possibilities of the industry.

The machinery and supply exhibit was one of the best of its kind ever held and drew large throngs of interested foundrymen.

Test bars are taken from castings which had cooled the quickest and at a point where the section of the shell was the thinnest.

In regard to analyses, when shells are made in France from cupola metal, Lieut. Laurent said the carbon varied from 2.75 to 3.25 per cent., with the combined carbon as high as is compatible with easy machining. In small calibre shells, he said the combined carbon should be over 20 per cent. of the total carbon. The percentage of silicon should not be in excess, as the lower the silicon the lower the graphitic carbon. The amount of silicon required varied from 0.85 to 0.90 and 1.60 to 1.75 per cent., according to the amount of total carbon, and according to the thickness of the shell, this affecting the rapidity of cooling. The proper silicon content had been determined by experiment, following which a formula for total silicon and carbon had been worked out. The total of these two elements should be less than 4.50, it being found that if this figure is exceeded, the metal will have inferior physical properties. As an illustration, he said that if the total carbon is 2.75, the silicon must be below 1.75, otherwise the strength of the metal will be impaired.

The regulating of the combined carbon by the employment of manganese was needlessly intricate, and that if more than 1.20 per cent. manganese were contained, the metal would be hard to machine.

Though phosphorus is a detriment to strength, it can be contained to the extent of 0.15 to 0.30 certainly without detriment. In France no experience had been had with phosphorus above 0.30, although in the United States good results had been obtained with the phosphorus as high as 1 per cent.

Sulphur in itself has no bad effect, although it makes the metal less fluid and tends to cause piping and blow holes. Machining is most easily done when the combined and graphitic carbon are equal in amount. Aluminum acts like silicon as it accelerates the formation of the graphite. It is necessary, however, to completely eliminate any aluminum.

Three methods of molding are in common use in France, in one of which the flask is rammed in the usual manner by hand or by a mechanical rammer; the second was a sectional process in which the mold parts were separately made, baked and then assembled. The mold in this method consisted of three parts, the base section, the body, and the nose section. Women were employed on this work and the method found its greatest use in 75 mm. shell manufacture. The third method was machine moulding, in which a plain jolting machine was used.

American Radiator Co. Practice

Mr. F. B. Howell, head of the research department of the American Radiator Co. and now connected with the ordnance department, gave an important talk on the practice of the American Radiator Company, valuable experience having been gained by this company through its British and French plants. A number of lantern slides illustrated this lecture and the detail of the various operations was readily followed. The core was in the speaker's opinion the essential part of the moulding. The shells are cast in one-part flasks in the green-sand molds, there usually being four shells in a flask, nose down, a drop gate of the trainer type being employed. The flask and pattern equipment should be made of cast iron and specially designed for the work in hand. The larger shell also may be cast in single flasks. A coarse, open, lightly bonded molding sand should be employed. The flask is not rolled over during the operation of making the mold and the ramming is effected on a plain jar-ramming machine. A dry-sand pouring basin takes the place of the cope, this basin containing a strain gate. The riser has the same diameter as the butt of the shell and a height equivalent to the diameter.

The shell may be cleaned on the outside by tumbling, although they are hard on tumbling mills. They also may be cleaned on the inside by means of a stiff wire cable, ⅝-inch in diameter, mounted vertically in a rapidly revolving spindle. This cable is whirled around the inside of the shell at a high rate of speed, thus quickly removing the core sand.

The principal operations involved in machining the shells also were explained and illustrated by Mr. Howell, including centering, tapping, turning, banding, painting, etc.

GRAY IRON SESSION

At the gray iron session Thursday the following papers were presented, a number being read by title only, the authors being absent.

"The Sale and Distribution of Foundry Pig Iron in War Times," by Charles J. Stark, editor *Iron Trade Review*, Cleveland. The importance of the baser steel industries in war trade was emphasized and the difficulties giving rise to Government distribution were reviewed.

"The Use of Positive Displacement Blowers in Cupola Practice," by Prof. W. Trinks, Carnegie Institute of Technology, pointed out the advantages of the pulsating flow of the positive displacement.

"Recent Developments in Burning Oil in Cupolas," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.,: Two cupolas used to melt iron for a 3-ton converter have been equipped to employ the Stoughton oil-burning process. Unusual conditions developing as a result of the pressure of war work have precluded an exact comparison of the results obtained when running the cupolas with oil with those secured with coke.

He sums up the advantages in three respects: saving in coke, in labor and lowering the sulphur content. Details of the equipment of the cupolas are supplied together with data on fuel consumption.

"The Continuous Two-Storey Foundry," by J. F. Ervin, Michigan Motor Castings Co., Flint, Mich. The author describes the handling operations encountered in a modern foundry making castings for automobiles and shows that 64 tons of material must be handled for each ton of castings produced. The design of the plant must be carefully worked out. The two-storey foundry has many advantages for work of this sort. Great care must be taken to provide for the proper conditioning of the sand. The method of handling and conditioning the sand at the Buick foundry is fully described and illustrated. If the moulding operations are conducted on a second floor, above grade, the building should be designed to avoid excessive vibration.

"A Rapid Method for the Determination of Graphitic Carbon," by Frank H. Kingdon. The procedure and apparatus used are described in detail and the results obtained are tabulated.

"Organizing a Foundry for the Economical Production of Gray Iron Casting," by Paul R. Ramp Campbell, Wyant and Cannon, Muskegon, Mich. The author believes strongly in the efficiency of a system of simple reports made out by the foremen themselves as a result of their contact with the men and their work.

MALLEABLE SESSION

The engineering applications of malleable iron were treated of in a paper read by H. A. Schwartz, National Malleable Castings Co., Indianapolis, on "Malleable Iron as a Material in Engineering Construction." Objections in the enginer's mind to malleable iron were said to result from a lack of knowledge of its many desirable properties. Characteristics of steel, gray iron and malleable iron were compared by means of a series of graphic diagrams and illustrations of test specimens.

"Experiments in Annealing Malleable Iron," by H. E. Diller, General Electric Co., Erie, Pa., gave a resume of experiments conducted by the author in the research laboratory of the General Electric Co. Samples were annealed in an Arsen vacuum furnace and in a silica tube heated by electricity from the outside. The experiments indicated that if the composition of the metal is correct the only thing needed for annealing is heat. The author also comes to the conclusion that a period of 48 hours only is required in a tunnel furnace. A discussion of this paper written by Philip d'H. Dressler, American Dressler Tunnel Kilns, in New York, was also read, in which the application of the continuous tunnel annealing furnace was dealt with.

A paper prepared by Major A. E. White, Ordnance Department, and R. S. Archer, Bureau of Aircraft Production, on annealing experiments, was dealt with in abstract by Mr. Archer. Lantern slides showing photomicrographs were shown. The annealing furnace used was similar to that described by Mr. Diller in his paper, but was electrically heated.

Donald S. Barrows, T. H. Symington and Co., Rochester, N.Y., described a new core room building recently placed in operation at that company's plant.

"The Integrity of the Casting," by Enrique Touceda, Albany, N.Y., touched upon much more than the title suggests and included a resume of the future of the malleable iron industry and indicated to what an extent this future depended upon the reliability of the product manufactured.

"Advantages of Malleable Iron for Agricultural Castings," by P. A. Paulson, Rockford Malleable Iron Co., gave the advantages of malleable iron over steel for many agricultural implements. The cost and reliability of malleable iron warranted its much more extensive use than at present.

GENERAL SESSIONS

At the two general sessions of the A. F. A. many papers of wide interest were read. Sand blasting and the selection of proper equipment for the work formed the subject of a paper by H. D. Gates, of the Pangborn Corporation, Hagerstown, Md. Mr. Gates recommends that the foundryman shape his investigations first to an intelligent understanding of what an efficiently planned system will accomplish and save, with purchase price a secondary consideration. The various types of sand-blast apparatus, including hose machines, rooms, cabinets, barrels and tables, are fully described, and their operating advantages and limitations are discussed. Dust control is also given due consideration. The advantages and disadvantages of various forms of abrasives are presented. The paper concludes with practical pointers on how to avoid operating troubles which usually arise from conditions not inherent in the sand-blast apparatus itself.

E. S. Carman, Cleveland Osborn Mfg. Co., presented a paper entitled: "Engineers: Their Relation to the Foundry in the Saving of Labor." The author discusses the tremendous waste of man power involved in making castings on the floor which can be more readily and economically produced on molding machines. The paper was accompanied by illustrations showing the tremendous savings that can be effected with molding machines and through modification of design where necessary.

An extremely interesting paper was presented by H. D. Egbert, Research Corporation, New York, on the Cottrell precipitation process and its application to foundry dust problems. This paper describes a novel method of collecting dust from tumbling barrels, sand-blasts, grinding wheels, etc., by means of electrical precipitation. The apparatus used in this process is fully described, costs are presented and the operation of the system is discussed. The underlying principles of the electrical precipitation processes also are described.

The "Commerce of Coke," by J. A. Galligan, Pickands, Brown and Co., Chicago, dealt with the growing ascendency of the by-product coke oven over the beehive type and made a plea for co-operation on the part of the foundryman with coke man and the securing of proper coke for the foundry work.

An interesting paper was read by Henry B. Hanley of the New London Ship and Engine Co., Groton, Conn., on "Effective Means of Improving the Quality of Foundry Sand Mixtures." This paper gave the results of numerous investigations by the author on the greater use of old sand in foundry work and the length of time required for mixing and the effect of adding various quantities of fire clay and sea coal was also determined.

The Banquet

The annual banquet was a largely attended gathering on Thursday evening. It was featured by an address by Charles M. Schwab, director general, United States Shipping Board Emergency Fleet Corporation. W. H. Blood Jr., assistant to the president American International Shipbuilding Corporation, Philadelphia, dwelt on the building of the great Hog Island shipyard, and illustrated his description with lantern slides. Major A. Radclyffe Dugmore, of the British army, told of the work of the British army and navy in the war, illustrated by lantern slides.

Directors for Ensuing Year

The nominating committee reported the following as its selection of directors for the ensuing year, and the nominations were unanimously adopted:

H. R. Atwater, Cleveland Osborn Mfg. Co., Cleveland; R. A. Bull, Duquesne Steel Foundry Co., Corapolis (Mr. Bull is now a captain in the Ordnance Department, A. E. F.); A. O. Backert, Penton Publishing Co., Cleveland; W. R. Bean, Naugatuck, Naugatuck Malleable Iron Works, Naugatuck, Conn.; W. A. Janssen, Canadian Steel Foundries, Ltd., Montreal, Que.; J. P. Pero, Missouri Malleable Iron Co, East St. Louis, Ill.; H. J. Koch, Fort Pitt Steel Casting Co., McKeesport, Pa.; H. A. Carpenter, General Fire Extinguisher Co., Providence, R.I.; H. E. Diller, General Electric Co., Erie, Pa.; S. T. Johnston, S. Obermayer Co., Chicago; W. G. Kranz, National Malleable Castings Co., Cleveland; Alfred E. Howell, Phillip & Buttorff Mfg. Co., Nashville, Tenn.; V. E. Minich, Sand Mixing Machine Co., New York; C. R. Messinger, Sivyer Steel Casting Co., Milwaukee; C. E. Hoyt, Chicago; H. B. Swan, Cadillac Motor Car Co., Detroit.

Opening Session

The joint session was opened by Governor Emanuel L. Philipp of Wisconsin, who dealt with the future prospects of American industrial life on a peace basis.

C. S. Koch, president of the Fort Pitt Steel Casting Co., now of the cannon section, production division, ordnance department, spoke of the work being done by the department and of the work being done by the foundries of the country.

A paper on "Co-operation Between the Railroad Administration and the Metal-Working Industries," by E. D. Brigham, manager iron ore, coal and grain traffic, United States Railroad Administration, Duluth, was real in the author's absence.

By means of a series of moving pictures, with accompanying verbal description, Major Frank B. Gilbreth, Providence, R.I., presented "Modern Methods of Transferring Skill." The pictures, which were so constructed that photographs faded into line drawings, showed how one could be taught the mechanism of shells, grenades and guns, and how a novice can be trained in the proper taking down and assembly of arms. Major Gilbreth laid stress on the importance of ascertaining the one best method extant and making that method general. The Browning gun was shown in action, being taken down and reassembled, likewise trench mortars, rifle grenades, etc.

President Fuller in his report summarized the recent advances in the foundry trade in general and said: "The installation of foundry equipment and modernizing of methods has been tremendously accelerated. Man power has responded to the call and the production secured by the combination of willing men and modern machinery has been in many cases fairly astounding.

"The advance in quality of products also has been notable in many instances. Electric and open-hearth furnaces both show improvement in results. Cupola operation is also coming in for closer study, the introduction of oil for fuel being one of the promising innovations in this connection.

"I would urge the conservation of coke as worthy of our earnest consideration, and while it is not wise to save in the furnace to the extent of losing through poor product, there is much useless waste in cupola practice and close attention to quality of material, upkeep of equipment, regulation of blast and conservative charging will show a handsome saving in many cases.

"Our government, in its endeavor to standardize many essential products, has touched the foundry industry in stoves and furnaces. Reducing styles and sizes in this industry, as in others, will effect great economies. A development which has been of peculiar interest is the changing from malleable to cast iron in the manufacture of hand grenades for the government, the change being made with a view to the safety of our troops.

"Of interest and promise to our industry is the adoption by the government of the semi-steel shell. Experiments with cast shells seemingly have been sufficiently gratifying to warrant the government in specifying a liberal production and the prophecy that this will take an important place in the industry. Standard methods of producing a satisfactory product are being earnestly studied and should be of assistance to all. The production of semi-steel shells promises also to be of interest to the malleable founder, as the air furnace is seemingly the ideal unit for producing a high grade and uniform material.

"The difficulties in the way of successful production of these shells are by no means slight. It is true that there have been advancements in methods in some instances, but in general the foundrymen are ignorant to a degree of what is entailed in the successful production of these shells and grief will result from attacking the proposition blindly.

"The production of grenades during the past year has been large. Much credit is due foundrymen for the manner in which shops have turned from lines very different to the successful production of grenade castings. The rifle grenade, made of malleable iron, calls for a casting soft enough to be easily machined and of tough composition, clean and sound, with the cores centrally located, etc."

The report of the secretary-treasurer showed that the association has a membership of 1,072. Also submitted were the annual report of the A. F. A. committee on foundry costs and the annual report of the board of directors.

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ENGINE BUILDING ON PACIFIC COAST

In a recent issue of this paper an article appeared entitled, "Vancouver Firms Pool Engine and Boiler Orders."

In the course of this article, Mr. McCulloch was quoted as stating with regard to the building of engines, that on the smaller types they could compete, but on the larger ones it would be difficult. In fact it had not been undertaken.

We are informed by Mr. A. F. Menzies, who is now in Ottawa representing the Wallace Shipyards, of Vancouver, that the construction of large marine engines and boilers has been undertaken and well carried out, and is proceeding very successfully. The following list of engines already built and in course of construction by this company remove any doubt on the matter:

S.S.War Dog, 1,350 I.H.P., now at sea.

S.S. War Power, 1,650 I.H.P., now at sea.

S.S. War Storm, 1,650 I.H.P., under construction.

S.S. War Cayuse, 1,000 I.H.P., now at sea.

S.S. War Atlas, 1,000 I.H.P., ready for trial trip.

One steamer, 1,000 I.H.P., under construction.

Vessel No. 100, 1,800 I.H.P., under construction.

Vessel No. 106, 1,800 I.H.P., under construction.

Two engines of 2,500 I.H.P.,, plans in hand.

The next size to be undertaken will be of 3,000 I.H.P.

The boilers for the above vessels are being constructed at the Vulcan Iron Works, Vancouver, and this firm are also building boilers for the vessels under construction at the yard of the J. J. Coughlan & Sons, whose boiler shop was recently destroyed by fire.

The foundry of the Wallace Shipyards Ltd. has furnished all the iron and brass castings for the above vessels, excepting the first two. The foundry has also turned out a number of propellers for the Imperial Munitions Board, and one large manganese bronze propeller for a coast steamer. From the foregoing it will be seen that engine and boiler building on the west coast is an accomplished fact, and we are pleased to correct the impression given by our previous article.

Producing Special Steel to Suit Specific Purposes

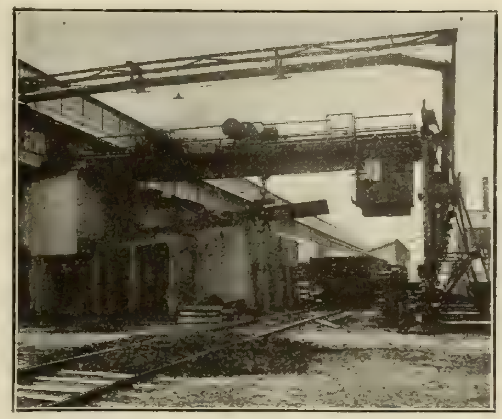
New Strip Mill at Massillon, Ohio, Adapts Steel to Methods and Machines—Produces Rolled Strips With Wide Range of Uses in Standard and Alloy Steels—Designed to Eliminate Manufacturers' Troubles

FOR years it has been to a great extent customary and quite necessary for manufacturers of machines and parts to consider what material was available in the market and then adapt their work and product to that condition. This has sometimes placed them at great disadvantage and has been a check to extensive improvements and development.

Within the last few years the use of alloys in steel making has passed beyond the experimental stag into standard use and practice. It has been the means of establishing new industries and developing new machinery and new method. In one product the evolution has promoted a plant totally different to any heretofore devised. It is the installation at Massillon, Ohio, of the plant of the National Pressed Steel Company, which was specially designed and built for rolling strips by an improved method and practice for a wider range of uses in standard and alloy steels.

Organized Effort

Realizing the needs of the situation a group of young men familiar with the difficulties incident to the deep drawing, stamping, forming and pressing of steel products, and also the need for new and better qualities, set out to build a mill to meet the demands. Their aim was to produce a wider range of sizes and the proper quality and physical characteristics in hot and cold rolled strips especially adapted to this particular class of work.



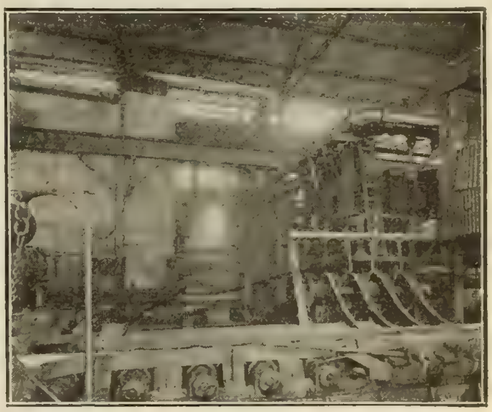


Fig. 1 is a view of the charging end of No. 1 Heating Furnace together with the Electric Overhead Travelling Crane serving it. The slabs are picked up by this Crane by means of a magnet and placed on the skids in front of the Massive Pushers. These machines are of unusually heavy design and are electrically controlled and operated. As hot slabs are drawn for rolling, cold ones are pushed into the furnace at the rear or charging end. Fig. 2 shows a partial end and side view of the No. 1 Heating Furnace with a portion of the Mill Approach Table, Roller Table and of the delivery end of the Slab Transfer in the foreground. Above the top of the furnace may be seen the pipes through which is conveyed the air and powdered coal, by means of which the furnace is heated.

Representative lots of steel intended for stamping and similar purposes were carefully examined by microscope analysis and other methods, all of which indicated the fact that while in the past research work had been carried on to improve the composition of steels in general, and that while some attention had been given to scale elimination, etc., very little thought had been given to the subject of mechanical treatment. This investigation and careful research convinced the designers that new methods and practice were necessary.

All the information and data obtained pointed to the necessity for a departure from standard machinery, methods and practice. Before designing the machinery, equipment and plant, which for the new purposes required many innovations in heating and rolling, it was considered necessary to consult the trade purchasing and using this class of steel in order to obtain complete data and authentic information.

Survey of Requirements

An abstract was accordingly prepared containing thirty-seven questions, each one important to the establishment of the new methods thought necessary, and so prepared as to require little time and effort in giving the answers. This was sent to a large number of manufacturers producing pressed and drawn steel specialties, and brought forth immediate and enthusiastic response. The returns reached forty-seven per cent., which answered in whole or in part the entire abstract.

With the complete data and reliable information then at hand bearing on size, finish, analysis, quality, physical characteristics, the design of this unusual plant was undertaken by the company's own men, carefully adhering to basic principles. In spite of adverse conditions in material and machinery markets, weather, etc., in ten months and one day from the time ground was broken the plant was in operation.

This plant with its special equipment, new methods and practice is now producing a material of such physical property and quality that without any annealing it can be used in a great many cases where formerly annealed strips were considered a necessity.

Inspection of Raw Material

Raw material is received in the form of slabs and billets and is unloaded from the cars by means of cranes carrying rectangular lifting magnets.

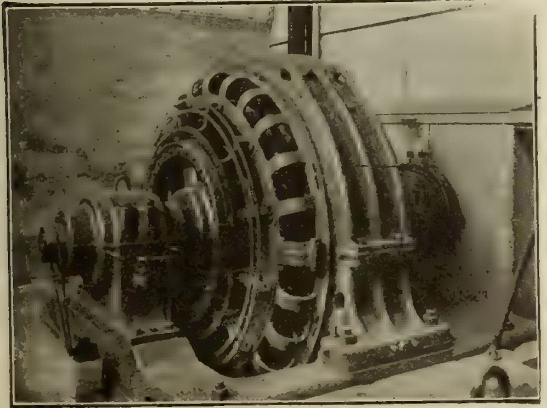


Fig. 3 is a view of the Westinghouse Reversing Mill Motor, which was designed and built especially for this installation. To one watching it in operation, it causes an almost uncanny feeling. Its silent and almost instant reversal from full speed in one direction to full speed in the opposite direction, giving no indication of the tremendous power being developed. This motor derives its power from a Motor Generator Set, which is shown in Fig. 4. To enable it to carry peak loads it is provided with a solid steel plate fly wheel. This form of construction is necessary in order to withstand the terrific stresses produced by reason of its high speed revolution—the rim of this fly wheel travelling more than four miles per minute.

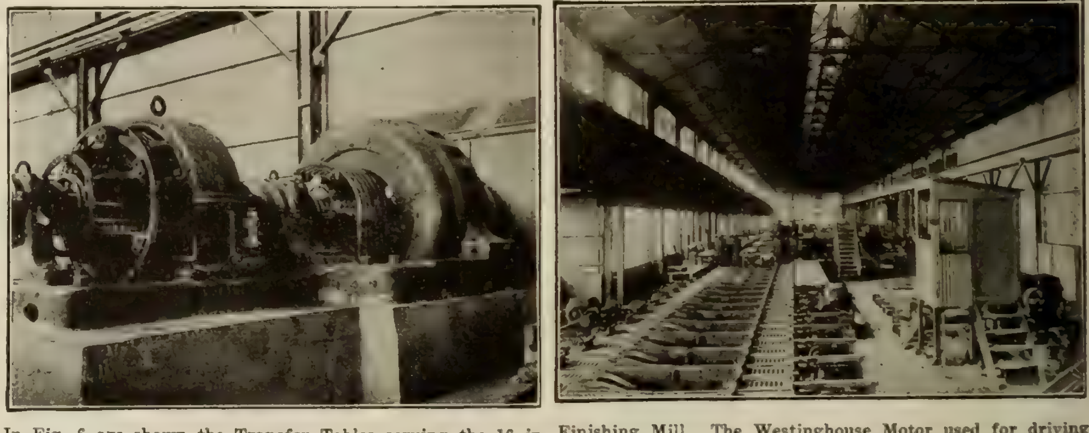
Before any material is placed in stock or used, each piece is carefully inspected for seams, pipes, or any other defects which could be rolled into the steel by later manipulation and not detected until the material was in the customer's presses. The stockyard has a capacity of from fifteen to twenty thousand tons of steel and adjoins the mill building.

Fig. 5—This shows a view looking down through the mill from a point near the 24 in. Universal Mill Rollers Pulpit.

Great care and attention were given to the design and detail for the furnaces to insure uniform heating. They are of the large continuous reheating type, using powdered coal as fuel. All parts and accessories were specially designed and constructed for this method of heating. Pushers, drawing machinery, door hoists, transfer tables and all equipment auxiliary to the furnaces are electrically operated. The steel is transferred to the roughing mill in a unique manner, and in such a way that practically all furnace scale is removed.

Roughing Mill

The roughing mill is a high-speed 24-inch two high universal mill and is driven by a Westinghouse reversing motor similar to those used in blooming mills but smaller and much faster. An idea of the extreme proportions of the mill will be conveyed by the statement that the housings weigh approximately 42 tons each, and that all other parts are correspondingly heavy. When it is borne in mind that this company produces large quantities of special alloy steels in the form of strips up to No. 00 gauge x 24 inches wide, the necessity for such heavy units will be appreciated. The extreme rigidity of the mill and foundations are also realized upon considering that when finishing 50 carbon steel less than one-thousandth of an inch (.001) is allowed for spring of the mill. The vertical rolls on this mill are designed and operated so that proper side work may be given the steel. This method of rolling also holds the width dimension to slight variation.



In Fig. 6 are shown the Transfer Tables serving the 16 in. Finishing Mill. The Westinghouse Motor used for driving this Mill is shown in Fig. 7. As in the case of the motors driving the Universal Mill this motor was also designed especially to meet the requirements of this particular installation.

If the material is brought to gauge on the roughing mill, the strip is turned over after rolling in order to facilitate inspection and remove any slight remaining scale. It is then transferred to a leveller or straightener of extremely rugged construction. From this the product is delivered to the hot bed.

Finishing Light Material

When producing lighter material only the roughing operations are used on the roughing mill, as a train of finishing mills has been provided for the final passes. These mills are operated entirely by mechanical means—no manual labor being required. Driving power is furnished by a Westinghouse motor of the Kramer type, permitting a wide range of operating speeds with good electrical efficiencies.

From these mills the material is delivered to hot bed or coiler as may be required. On leaving the hot bed the strips are cut to length and piled by a mechanical piler, placed in stock if they are to be shipped as plain hot rolled material, or transferred to the finishing department if additional treatment is required.

In addition to the usual slitting, shearing, oiling and liming machinery, the finishing department has extensive facilities for heat treating and pickling. Each furnace has a charging capacity of approximately twenty-five tons and also the necessary mechanical means for reading and heat control, assuring uniform heat treatment. The furnace men can observe and control the furnace temperature at all times, but the recording instruments and the records are seen only by the department superintendent, who thus has a definite and accurate record of all conditions and every operation employed on past work. The pickling vats are of the plunger type in standard details, but of large size for pickling large pieces whether flat or coiled. The steam for heating pickle liquors and other miscellaneous heating processes is generated by a boiler placed over the annealing furnace flues.

Research Department

The research department continues further investigation through their physical and chemical testing laboratories. These laboratories provide to the inspection department all tests needed to insure thorough knowledge of materials produced, the extent of tests being dependent upon character, quality and ultimate use of material on order.

The plant has a number of unusual and interesting features.

(a) Electricity used for power throughout.

(b) Practical elimination of hard physical and hand labor which formerly has been the rule.

(c) Large clean, well lighted and well ventilated buildings.

(d) Extensive methods and extra care to eliminate scale.

(e) Unusual, heavy equipment to bring size variation to a minimum.

(f) Unusual rolling methods to produce steels and alloys in steel of superior quality and new characteristics.

Experiments, investigation and research as continued by this organization will doubtless develop further data and information to enable production of materials with other new qualities and characteristics, and thus the field for specialties manufactured from such source of supply will be extensively broadened and developed.

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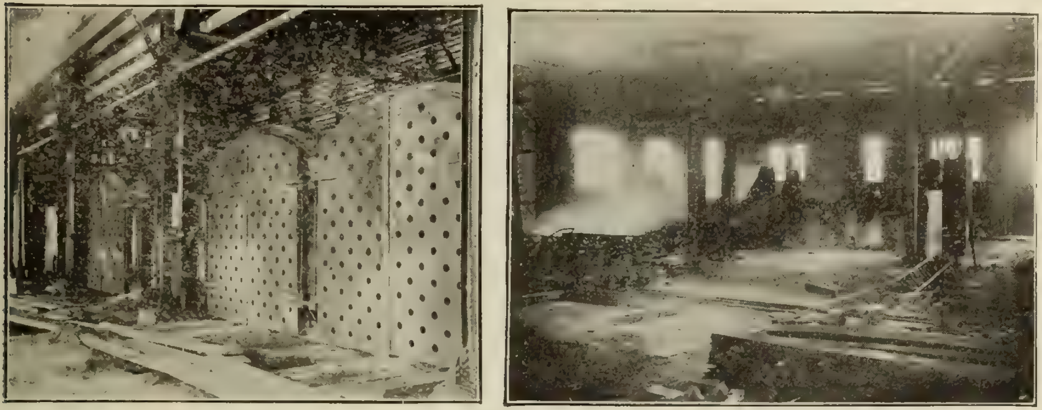
HOW WORKMEN TEST STEEL

The Steel Treating Research Society of Detroit have done good work in recent months in directing attention to the discussion of vital steel problems. At a recent meeting they were addressed by John F. Keller of Purdue University, Ind., who made some interesting statements regarding the methods by which workmen test various steels.

Some Common Methods

Among the various ways of judging the quality of steel, the most common are: trade or quality stencil marks, labels pasted on the bars, bars painted different colors, general shape of the material, appearance of surface, heft or weight, ring or tone of metal when dropped, feeling, intuition, smell, fracture test, fire and water test, service test, and spark test.

The first two are the most dependable methods, except that if the steel is kept in a damp place the labels will drop off in the course of time due to rust. The third method is dependable if a general scheme of colors is used for the different brands of steel and the system is intelligently applied. There is, however, in many factories extreme carelessness and indifference in the painting of valuable stock; in one factory seven grades of stetel were painted one color.



In Fig. 8 several of these furnaces are shown, while in Fig. 9 is shown a corner of the Pickling Department.

Shape

Many workmen select steel by its general shape; for instance, a hexagon section will represent screw stock and an octagon section will indicate cold chisel steel. But this method of selecting should not be tolerated, because steel can be manufactured into any form or shape desired, except stellite, which is cast into form. It may surprise some engineers to learn that many tool steels are selected by the appearance of the surface. If the bars are smooth and have sharp corners, it is evidence to the workmen of first-class steel. Without other evidence, expensive labor is put upon the tool and usually only when hardening is the mistake discovered. Smooth surfaces and sharp corners indicate work at low temperatures, while rough surfaces and round corners are caused by an iron ovide scale when the metal is laid down at high temperature; therefore, the appearance of the surface does not indicate the quality or composition of the metal.

Tone

Many workmen, not satisfied by the shape, appearance and weight, drop the metal on a hard floor or a heavy piece of iron; if the ring is a sharp tone, the metal is thought to be a good quality of steel. The finer the grain the more homogeneous the structure, and the harder the metal, the sharper is the tone. These qualities are developed by elements in the metal by working, and by heat-treating at a moderately low temperature. On the other hand, wrought iron will emit a dull tone owing to the presence of about 2 per cent. of slag and the usual methods of working such metal at a high temperature. This method is not reliable or dependable, because work and heat-treatment will affect the tones emitted when the material is struck or dropped.

It is surprising how many expert toolmen will select material by intuition; and because of their opinion they work the tool into shape regardless of any indication in its cutting properties that the metal may be undesirable. Their mistake is usually discovered when attempting to harden the metal or when putting it into service. It is said that in the southern part of the state a man nicks a bar of stock with a cold chisel, breaks it in two, and immediately smells the fracture, claiming that a good quality of steel smells like ammonia. There is no ammonia in steel. Many of the tests used by workmen are just as reliable.

Fracture

The fracture test does not represent the true quality of metal, but rather indicates the last heating operation to which the metal was subjected. A fracture that has a coarse granular appearance may not mean that the material is of inferior quality, but that it was laid down at high heat and the crystals retained the size corresponding to that heat. There are exceptions to this rule, however, for many of the elements in alloy stetels prevent or retard crystallization at high temperature. High-speed steel shows an unusually fine grain after being heated to 2,250° F.; on the other hand, carbon tool steel heated to its critical temperature and immediately quenched shows a fine silky structure, and it is doubtful if the average mechanic is able to distinguish these metals when they are placed together for comparison. If a small piece of carbon tool steel is heated to just above its critical temperature, about 1,450° F., known as a dark cherry red, and immediately quenched in water, it will be hard enough to resist a sharp file; and when fractured it should show a fine silky structure. If low or inferior grade of carbon steel is treated in this manner the surface may be hard enough to resist a file but the fracture will not show a fine structure.

Haphazard

Many workmen as well as the exexperimental engineer select available material at hand without any determination as to quality, and then put expensive labor upon the part or tool. When finished, it will be tried out in service, and if it fails, something else is tried. Such failures are usually found in the scrap heap. The service test, however, has its advantages if the engineer has a knowledge of the material so tested. This information is invaluable as it is the combination of successes and failures that gives the empirical knowledge that completes the perfect understanding of theory. A record of the life work of a piece of steel and accurate data are the most powerful tools that an engineer has. Therefore, the scrap heap of failures is the most instructive place about a plant.

The spark method is based on the action of the oxygen of the air on the combustible element present in iron and in many of the alloying elements contained in the different steels, which act explosively when heated to a temperature necessary for combustion. To produce bright sparks as the result of heating finely divided particles of metal, the heat must be intense enough to cause chemical combustion between the oxygen of the air and the particles of metal.

RECOVERING METAL FROM FURNACE FUMES

By M. L.

There has just been erected at Sheffield a plant for the recovery of metallic particles and other by-products from furnace fumes. It was discovered about 1906 that by passing gases containing dust of solid and liquid principle to various forms and types of industrial electrodes, charged with the high voltage of 50,000 to 100,000, dust and liquid particles could be carried over to one or other of the electrodes. Since that time the inventors of the process, which is of American origin, have not only successfully recovered valuable properties from waste fumes, but have also got rid of smoke and the smoke nuisance. Metals, such as zinc, silver, copper, lead and aluminum, have been recovered, besides coal-tar and other by-products of commercial value. The experiments made at Sheffield are yielding satisfactory results, and other firms in Britain are now beginning to instal the plant in an encouraging fashion. The British Government have made one installation. The installation appears to provide a thoroughly efficient remedy for the smoke nuisance, but the treatment of ordinary carbon fumes is unlikely to prove a profitable proposition, and for that reason the installation of the plant purely as a smoke abatement device is scarcely within the realms of probability.

Not Necessarily

"'One wife too many!'" exclaimed Mrs. Wederly, as she glanced at the headlines of her husband's paper. "I suppose that is an account of the doings of some bigamist?"

"Not necessarily, my dear," replied her husband, without daring to look up.

WARPING OF STEEL CASTINGS

In a paper, read before the British Foundrymen's Association, Mr. T. Brown points out the causes of deformation of steel castings, and the means employed to remedy them. He divides the causes of deformation into two main classes, the first being due to the cooling from the molten state, through solidification to complete cooling.

The second class is due to the expansion occurring when the casting is heated from the cold state to the annealing temperature in the annealing furnace.

Deformed Stern Frames

In a shop where many stern frames for mercantile ships were cast, there was considerable trouble with a design known as a plain frame, these frames being invariably out of shape. This occurred in spite of the great care used in setting the pattern in the bed, which was done by the pattern maker. The pattern was lined up by parallel blocks, straight edges, and string lines, but when the castings were delivered to the machine shop they were not lineable, as the pattern had been on the floor.

Various theories as to the cause of this were promulgated, and a man was appointed to make a study of setting the castings in the annealing furnace to bring them back to shape. The chief trouble was that the lugs, or gudgeons, for carrying the rudder were out of line on the casting, although perfectly true on the patterns. Mr. Brown points out that in this case, instead of remedying, or attempting to remedy the defect, after casting the pattern maker should have set his pattern to counteract the expected deformities before pouring.

Explosion of An Anvil Casting

Breaking, due to unequal contraction, is another danger to which steel castings are especially liable. Mr. Brown instances the case of a base for an anvil block, of approximately the following dimensions: 10 feet square by sixteen inches thick, with a dovetail piece running round its top side for packing the anvil. This casting being urgently required, the flasks were removed from the sides to allow the atmosphere to reach them, and as soon as it was thought safe to lift, was sent to the cleaning shop, and work was commenced on it at the earliest possible moment. The top and sides were stripped, the sand remaining on the bottom owing to the dovetailing. In the course of a day or two it was turned over, and the sand taken from the bottom as cast. It was now sufficiently cooled to allow some cleaners to sit on the top to level the surface for the anvil, and while they were so engaged the casting broke with a report equal to a heavy gun, bringing down clouds of dust from the roof. After the dust cleared away, it was found no one was hurt, but the casting was broken in two pieces almost straight across, and 15 inches apart.

Mr. Brown analyses the cause of this break as follows: The air being allowed to attack the sides while still hot, they would contract. This would put the outside in a state of compression towards the centre, and would continue till the outside was perfectly cold, when compression would cease. The sand over the center would retain the heat at this part, and consequently as it cooled gradually it would contract and bring the outside into tension, the strain being sufficient to cause breakage. The outside, or cooled part, having the largest area, the center had to give way, with the result already described.

Mr. Brown's opinion is that the only safe way to cool castings is to leave them in the sand till quite cool. He considers that the practice of putting the castings into a furnace to cool down is attended with grave risks, and states that he has no knowledge of a casting being broken before removal from the sand. He recognises the fact that a large amount of floor space and flasks are required to carry out his suggestions, but considers it worth while, rather than run the risk of losing valuable castings.

Heating Steel Castings

Taking up the second part of the subject, namely, the deformation due to alteration in temperature during annealing, the author shows how these defects are caused, in his opinion. He points out that in nearly all annealing furnaces the heat comes in at the side or end, the result being that one part of the casting becomes heated before the rest. As an instance, he cites a large spur wheel with only a part of its rim exposed to the flame. This part will expand and become mis-shapen, and will remain so until the whole casting is heated to the same temperature. When the cooling process begins, the whole wheel cools down equally, and the deformed part has no chance of regaining its original form. The remedy for this is obviously to design a furnace, wherein the heat would be distributed with absolute uniformity. With regard to the breakage of castings after the removal from the annealing furnace, Mr. Brown claims that this is another case of allowing atmospheric temperature to attack the casting before sufficient cooling has taken place. He substantiates his claim by two instances. The first is a fly wheel of 13 feet diameter, with six arms, and a light boss, as compared to a very heavy rim. Owing to shortage of floor space the casting was placed in a furnace to cool. When considered sufficiently cool it was taken out, but the following morning was found to be broken through the rim, also three arms. What took place was that the rim having very little sand adhering to it, the cleaners started to remove the sand from the boss and rims, exposing them to the air. They being of light section were the first to cool and contracted towards the centre, putting the arms in tension with the rim; the outside being warm, yielded to the tension, and this continued till the boss and arms were cool and contraction completed. The rim, being of heavier section, did not cool so quickly and consequently the contraction proceeded after the arms had finished. The arms, being unyielding, the rim had to give way and break.

Another case of a wheel being removed from the annealing furnace before cooling was completed was equally disastrous. This wheel was a plate wheel 12 feet in diameter, with an 8-inch thick plate, the rim in this case being cast separately. In this case, owing to the plate being thin as compared to the boss and feeding head combined, the air attacked the plate and caused contraction and compression toward the center till quite cool on its outer surface, and contraction had ceased. However, owing to the centre being of much heavier dimensions it did not cool as rapidly as the plate, which caused the outside of the plate to be in tension. The stresses then set up caused the wheel to crack across, although it did not fly apart. The only flaw visible on the outside was a hair line, and the centre had opened ⅛-inch, which proves that the outside had ceased contraction before the centre part had contracted to its minimum dimensions.

In the discussion which followed, Mr. Watson disagreed with the author as to the advisability of leaving the castings in the sand till cool. His own practice was to lift the casting as hot as possible and place it in a furnace to cool, first roughing out the cores. It was his opinion that castings should be cleaned of sand after preliminary annealing, and then annealed again in a clean condition.

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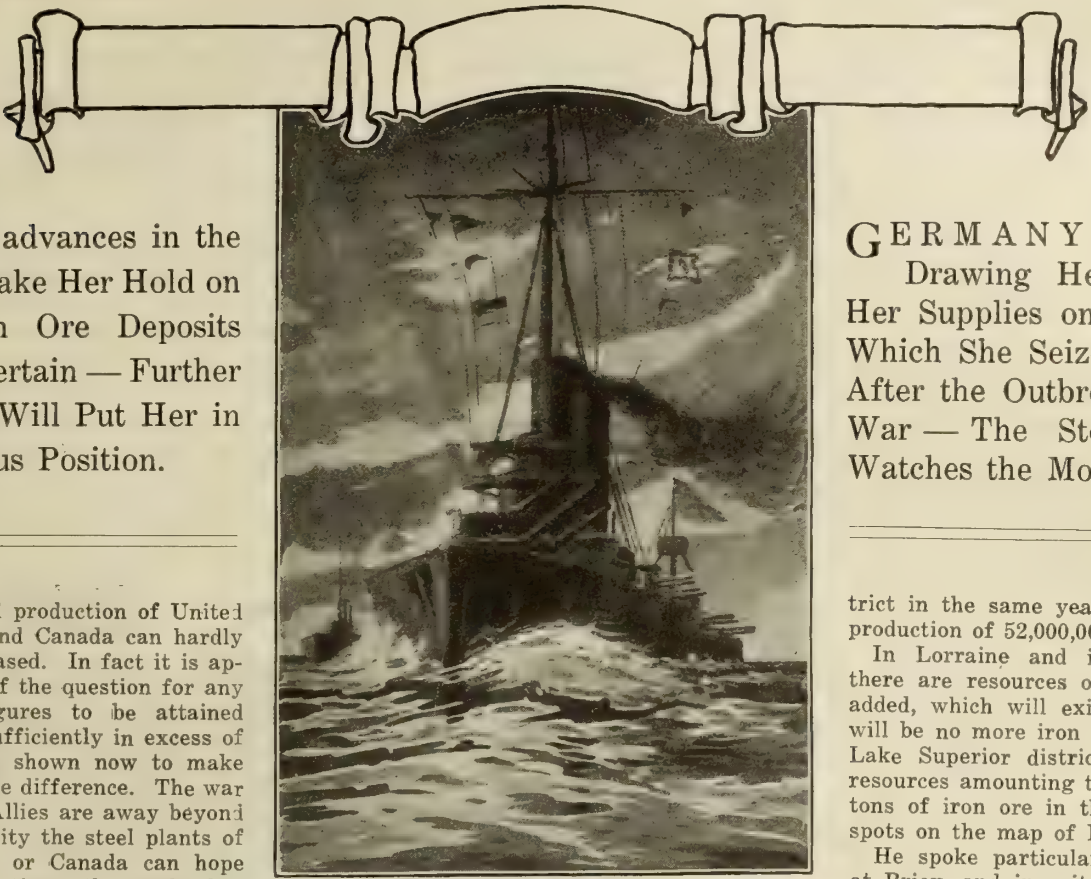
ST. LAWRENCE NAVIGATION EXTENSIONS

By D. I.

During the past decade, interesting and, as results have shown, important experiments have been carried out by the Quebec Board of Trade and others on behalf of the Canadian Government, with a view to ascertaining to what extent the navigation season of the St. Lawrence, which officially opens about the beginning of May and closes towards the end of November, is capable of prolongation. Those who took part in the inquiry are, definitely of opinion that ships may run between Quebec and the sea at all times of the year, and the Dominion Marine Department is now being urged to provide the additional safeguards that are considered necessary, such as sheltered storm centres, buoys and wireless stations. By this means it is believed regular cargo steamship services could be established between Quebec and the United Kingdom all year round. The employment of powerful ice-breakers would also be essential in lower reaches of the river. A board of marine underwriters for Canada on the lines of Lloyd's is about established at Montreal. It will among other things provide for a system of correspondents all over the world, and supply early and accurate information of wrecks and casualties with special reference, however, to conditions on the St. Lawrence.

Germany Losing Grip on Iron and Steel Sources



RECENT advances in the West Make Her Hold on Great Iron Ore Deposits More Uncertain — Further Advances Will Put Her in a Precarious Position.

GERMANY Has Been Drawing Heavily For Her Supplies on Territory Which She Seized Shortly After the Outbreak of the War — The Steel Trade Watches the Move.

THE steel production of United States and Canada can hardly be increased. In fact it is apparently out of the question for any production figures to be attained that will be sufficiently in excess of what is being shown now to make any appreciable difference. The war needs of the Allies are away beyond the best capacity the steel plants of United States or Canada can hope to reach. At times the trade has been led to believe that it would be possible to have a surplus over war production to be distributed to the commercial trade. And just as often it has been shown that the production of the plants could not take care of the war programme. The commercial users of steel have ceased to look for relief as long as the war lasts.

The Next Best Thing

And so it is that the steel trade on this continent watches with compelling interest the advance of the Allied armies toward those parts of the western front that contain the steel mills and iron ore from which Germany has drawn the great bulk of the material with which to wage the war.

Germany herself is not rich in iron ore, but Germany, with the territory which she seized in 1871 in Lorraine, the land which she overran in 1914, and the domination which she has gained over the steel centres of France and Belgium, has been a greater producer of iron and steel in the war years than ever before. Germany had this well planned, and it has served her purposes to perfection.

Not only has it helped Germany, but it has handicapped France. When France lost the Briey-Longwy fields, she lost from 65 to 70 per cent. of her steel production, 85 per cent. of her iron ore supply, and 55 per cent. of her best mechanics.

But In Spite of This—

Mancel Knecht, a member of the French High Commission in United States, and a native of Lorraine, in a recent address dealt most effectively with this very point, stating:

"But in the face of 1,500,000 of her men killed and as many more wounded, and 3,000,000 in occupied territory, she has been able, with the help of British coal and our own steel, to equip by June, 1918, with field guns, 20 divisions of the American army, meanwhile having helped Russia, Serbia, Rumania and other allies not only with prodigious quantities of munitions, but with officers to instruct and train."

The same speaker also gave statistics to show what Germany had gained by securing control of the iron and steel sources on that section of the continent.

In 1913, he said, the annexed part of Lorraine, which was under German domination, produced 21,000,000 tons of iron ore. And the French part, which had not been taken by Germany in 1871, the part which has been occupied, nearly all of it, since 1914, produced in 1914 19,000,000 tons of iron ore. In the same year, 1913, the whole German territory, excepting the annexed Lorraine part, produced only 7,000,000 tons of iron ore. In the Lorraine district, he continued, we produced in 1914 48,000,000 tons of iron ore, and in your Lake Superior district in the same year there was a production of 52,000,000 tons.

In Lorraine and in Luxemburg there are resources of iron ore, he added, which will exist when there will be no more iron ore left in the Lake Superior district. "We have resources amounting to 5,330,000,000 tons of iron ore in those two little spots on the map of Europe."

He spoke particularly of the ore at Briey, and in spite of the depth of the mines and the necessity of unwatering them, the ore was obtained in 1913 for 4.69 francs or about 90 cents per metric ton. The importance of this deposit he emphasized in explaining that its output amounts to 76 per cent. of that of the Longwy-Briey-Nancy district.

Meanwhile France has been developing a rich iron ore in Normandy, and Mr. Knecht expressed a lively conviction that before long the much-talked-of tunnel under the English Channel will be a fact and French iron will go into England and France will be getting in return the coal she needs from England and Scotland.

Menaces Germany's Control

And so it is that the recent advances that push the danger zone nearer to Germany's control of the iron and steel sources are of unusual interest to this country. Robbing Germany of iron and steel is one grand master stroke. It means lessening Germany's supply of steels, of munitions, of guns—it means that where she fired two shells she may find it hard to fire one. It means, in short, that Germany's power will be weakened. There is nothing surer than that.

The steel plants in Eastern France are mostly at Longwy, Briey and Nancy; in Belgium they are for the greater part near Charleroi and Liege. In German Lorraine, Thionville can be said to be the centre of the industry. The iron ore fields are fairly well distributed. In the north the ore is at Longwy for the most part, Briey in the more central territory, while to the south Nancy is the centre. About one-half the pig iron of Europe is made from these deposits, now almost entirely controlled by and operated for the benefit of the German war machine.

Germans Have It In Figures

Germany is well aware of the immense advantage that her early war operations have been to her. The Hun war machine has it all reckoned in stacks blown and tons produced. Before the Association of German Ironmasters in Dusseldorf, on January 30, 1915, Dr. Emil Schrodter, in an address, said:

"In France, Germany now holds parts of 10 departments, covering an area of about 5,250,000 acres with a population of 3,255,000. This means a German control of 68.8 per cent. of the coal output of France; 78.3 per cent. of the coke output; 90 per cent. of the iron ore; 85.7 per cent. of the pig iron output; 76 per cent. of the raw materials, including 95.3 per cent. of the basic Bessemer steel and 76.9 per cent. of steel castings, and the entire output of tubes. All but one of the French locomotive and railroad car plants are in German hands. For wrought tubes the French will have to rely on British and American supplies. Practically all of the French iron-ore mines are in territory occupied by Germany.

"Out of 170 French blast furnaces, 95 of the 127 in blast when the war broke out are in the war zone. Because of ore scarcity only 30 of those still in French hands are able to run, and many of these are small. Hence 80 per cent. of the total French blast-furnace capacity is out of commission. Of the French steel plants 70 per cent. are in German hands. Steel plants uninjured are largely idle. At the horse-shoe works at Valenciennes enormous stocks were found and appropriated by the Germans."

Summing up as to France, Dr. Schrodter said: "While we on the German side are able to draw upon enemy stocks, the French army is deprived of the greatest part of its manufacturing resources and has to get its material from foreign countries. Hence France has already been so severely hit as to cripple and partly destroy her economic power."

Germany Fears It, Too

And so it is that Germany seeks to secure iron ore from Sweden. Sweden has the ore, and it's good ore, too, but Sweden depends on the Allies for a good many supplies. So if Sweden choses to sell iron ore to the Hun the Allies may be inclined to cut off certain supplies without which Sweden would be in a sorry way. And so Sweden may hesitate, and the chances are that she will.

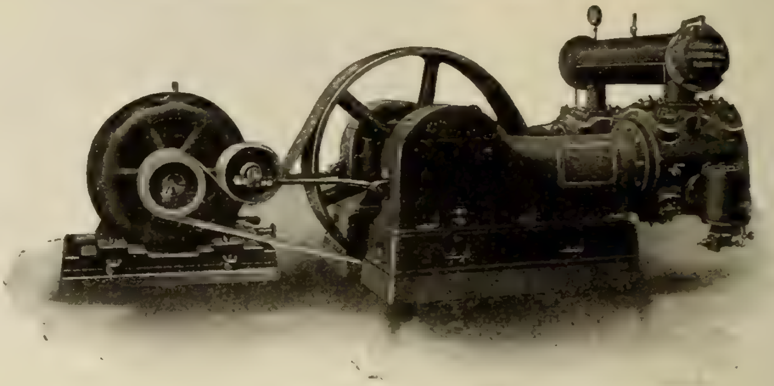
The American advance that wiped away the salient at St. Mihiel means much. Germany knows what it means, and the steel trade knows what it means. And every move that brings the Allied forces closer to Briey means that Germany is going to lose the power that she has gained from stolen iron. The progress of the battle is interesting. There's more in the outcome than a few miles of territory. Without iron and steel Germany or any other warring nation is beaten hands down, and the day when Germany is going to lose her grip on the iron ore deposits and the blast furnaces of France is coming very close. Watch it.

THE SHORT BELT DRIVE FOR AIR COMPRESSORS

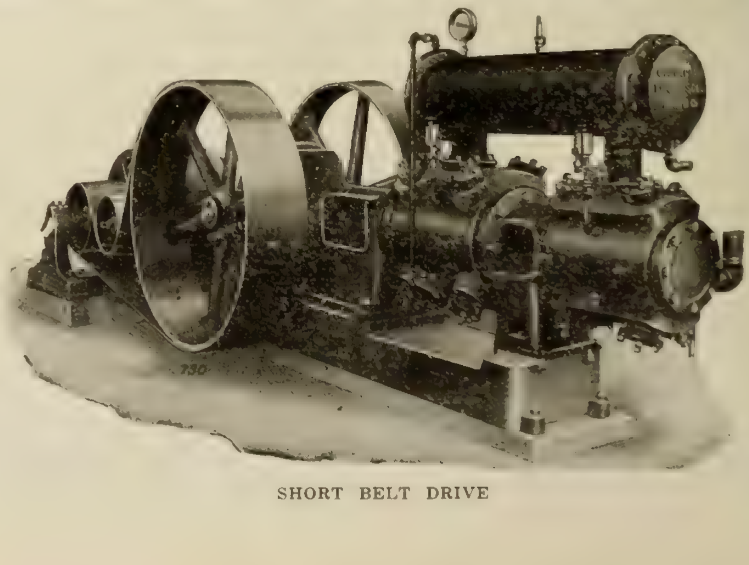
COMPRESSED air is a necessity in most plants. In the machine shop the air chuck is becoming more and more common, air hoists are used for heavy work in the machine shop and the foundry, and in the yard. In the majority of plants that use compressed air the installation of the compressor is usually a problem. In many plants the air compressor has to be squeezed somehow into an existing power-house where space is at a premium, and the question of the compact air compressor becomes very acute.

The steam-driven compressor by the very nature of its construction takes up very little room, but the steam driven type is not so common nowadays, and is usually found where steam is already generated for some other purpose. Now the ordinary belt drive for any type of machine takes up quite a floor space, and the compressor 8 feet long needs almost three times its own length for the ordinary belt drive. For the larger sizes the drive by direct-connected motor solves the space problem, but this form of drive is best suited to compressors large enough to require a motor of 100 H. P. or more, so that the direct driven compressor is not much help to the man who wants to get a small compressor into a corner "two by twice."

The short-belt drive solves the problem for him. The principle of the short-belt drive is best explained by a reference to the illustration; it consists simply of a light idler pulley riding on the belt between the compressor and the motor. But there is an important difference between the idler pulley of the short-belt drive and the ordinary idler; in the short-belt drive the idler is carried on arms mounted on the compressor frame, these arms are free to move up and down to a limited extent. Now the objection which at once leaps to the mind is that this idler pulley will increase friction to such an extent that other benefits will be of little use. However this objection is not so formidable as it looks. If the idler were rigidly fixed the friction would be objectionable, but it is not fixed, and the very slight added friction does not weigh against the advantages of the drive. So much is this the case that at least one large American company makes a specialty of



SHORT BELT DRIVE



SHORT BELT DRIVE

short-belt drive for large mill power transmission of all descriptions.

As to the advantages:—in the first place the short-belt drive saves space; a 10 x 8 inch Canadian Ingersoll-Rand EL-1 air compressor with short-belt drive takes up only 11 ft., 0 in x 3 ft., 0 in.—belt, motor, and all. The outlay on belting is reduced, and the increased contact angle on belt wheel and pulley adds a good deal more to the efficiency of the drive than is lost in idler friction. Lastly the belt needs no extra initial tension—many a good belt has been stretched too much for its first run;—and the idler automatically looks after tension.

Where compressors are concerned both chain and gear drive are not only very expensive, but they are too rigid, and consequently wear quickly, so that they are not very serious competitors of the short-belt drive—and the short-belt drive is noiseless.

In the installation care should be taken to follow carefully the maker's instructions regarding alignment. The correct location for the idler is just where it would be in the sag of the belt if there were no arm to restrain it. The belt should be slack enough so that it will wrap around the small pulley at least 180 degrees and preferably more usually made up endless by the manufacturer and given a special treatment to make it pliable for this service. With this type of drive it is considered advisable to use belt dressing very sparingly.

The Flu Hits the Industrial World Hard

In the Philadelphia District Almost a Quarter of a Million Men Are Laid Aside—Instructions That C.M.A. Are Sending Out Regarding Fighting the Malady

THE manufacturing interests are being hard hit in many cases with Spanish influenza. In many cases it is like the old la grippe; in many others the trouble really comes from pneumonia following the first attack.

The best authorities say there is nothing to take as a direct preventive. The only thing in this direction is to try and keep up the powers of resistance to as high a point as possible. In some cases the victim is taken suddenly. In fact it is on record that cases have terminated fatally in eight hours.

It is interfering with production in many centres. In Philadelphia for instance the conditions are as follows:

The ravages of an epidemic of Spanish influenza, grip and colds constitute a serious factor in works' production. It is reported that plants in the Chester and Eddystone district, including the Baldwin Locomotive Works, are short 50 per cent. of their workmen. One plate mill's production dropped to one-third last week; it had been operating at over 95 per cent. Some others show a reduction of 25 per cent. in workmen. The Hog Island ship plant is short about 10 to 15 per cent. of workmen. It is reported that Worth Bros. Co., at Clayton, Dela., will close down temporarily. There are said to be 200,000 cases of influenza in Philadelphia, and strict measures are being taken to fight the epidemic. Office forces are badly depleted and much work is being held up. Plate mills are also watching their pig iron and coal supplies closely. The mills buying these materials are using them from hand to mouth and are unable to accumulate stocks for the winter.

Industrial centres in Canada report much the same condition of affairs.

What to Do

The Canadian Manufacturers' Association is issuing a circular prepared by Dr. Hastings, medical health officer for Toronto. The circular is as follows:

"Influenza is an acute communicable disease and is contracted by coming in contact with the secretions from the nose, throat and mouth of a person who is ill with the disease. For this reason every effort should be made to avoid such contact. This may be done as follows:

"1. The person who is taken ill must go to bed promptly. Early going to bed minimizes the danger of the disease. Furthermore he is thus removed from association with healthy persons. He should be provided with his own toilet articles, eating and drinking utensils, which should be sterilized by boiling after use. All discharges from coughing and sneezing should be collected on a piece of gauze and destroyed by burning.

"2. The attendant should be extremely careful not to touch his own face or mouth with his hands while handling the patient or infected articles in the sick room, and should cleanse his hands with soap, water and a nail brush, and hold for five minutes in antiseptic solution (1 in 40) carbolic, or (1 in 1,000) bichloride, on leaving the patient. In this way the attendant will protect himself from the disease, and if he washes his hands thoroughly will not carry the disease to another.

"3. Every person should endeavor to maintain the highest standard of general health by taking suitable exercise in the fresh air, eating wholesome food, and sleeping with the windows open and arranged so that no draught is produced.

"4. Crowded places such as street cars, mass meetings, moving picture shows, theatres and other gatherings should be avoided at this time.

"5. Kissing should be avoided.

"6 No food should be taken without previously washing the hands, and the hands should be kept away from the mouth and nose at all times.

"7. The nose and mouth should always be covered with a handkerchief in the act of coughing or sneezing.

"8. All persons, especially those engaged in factories, large business establishments, etc., where a number of people are congregated, should report on the first sign of illness and be relieved of their duties. To endeavor to fight off the disease by continuing at work not only renders the severity of the illness more severe, but also exposes others to the disease.

"9. The symptoms in typical cases are as follows: An acute and sudden onset with headache, intense, just behind the eyes, pain in the small of the back, and sometimes in the region of the stomach, elevation of temperature from 101 degrees to 104 degrees with comparatively slow pulse rate. The face is flushed, the tongue coated, and in every case there is some redness of the eyes. Great prostration is experienced and the patient usually lies in bed in a 'huddled-up' position. In some cases sore throat and cough are noted, and with many only part of these symptoms are found.

"The temperature becomes normal and the patient recovers within five days, providing complications such as pneumonia, middle ear diseases and affection of the heart do not occur. These may be avoided by prompt and careful treatment.

"Consult your physician as soon as you have reason to suppose that you have the disease."

◆

Coke Ovens Start.—In the presence of President Workman and plant officials, the first battery of the new coke ovens of the Dominion Steel Corporation at Sydney was placed in operation. The sixty new ovens will produce 1,300 tons of coke a day.

Not For Some Time.—The Port Colborne "Citizen" says: A story credited to Arthur Carty, which first appeared in the Toronto "Star Weekly," states that the Hydro Electric Commission will soon have an additional 50,000 h.p. available. Mr. W. I. Bennett, electrical superintendent of the Canada Cement Co., says a large black question mark should be placed after the word "soon." Mr. Bennett has been over the ground where the development work is in progress which will be the source of this additional power, and taking into consideration the length of time which it has required to do what has been done, he can see no possibility of the work being completed until well on in 1919. The hope that the local cement plant would soon be supplied from this additional source of power must still be classed amongst the hopes deferred.

The Electric Furnace in the Steel Foundry

A Resume of the Progress Attained in the Electric Furnace Field During the Past Few Years—Read Before the American Foundrymen's Association at Milwaukee

By W. E. MOORE, W. E. Moore and Co., Pittsburg.

UNTIL about five years ago, the electric furnace in the steel foundry was practically unheard of. It was generally understood that the product of the electric furnace while of the highest quality, was so costly to make that it might be considered commercially practicable only for the production of the best tool steel, or the highest grades of alloy steel.

In the last two years, a great light has broken over the electric furnace situation for the steel foundrymen. To-day the foundrymen are beginning to consider most favorably the electric furnace for steel foundry work, as by that process both small and moderate sized castings of intricate character can be made wherever suitable electric power is available, better, I believe, than by any other known process. This statement will be surprising to many, but it is borne out by the records from a number of operating plants. Steel foundry practice only follows out the general rule that whatever can be made better by an improved process will in the end be manufactured cheaper.

Why Electric Steel Became Popular

Primarily, electric steel became popular for its superior physical properties. While such steel can be made with a more satisfactory chemical analysis, using the same grade of raw materials than by other processes, experience has abundantly demonstrated that when made to the same chemical analysis ,it will average about 15 per cent. greater tensile strength or ductility, depending upon its heat treatment, and is more resistant to shock and better able to receive heat treatment. The reason for this is that the steel, being made in a closed furnace and in a reducing atmosphere away from the contaminating influence of combustion gases, is more solid, freer from gases and less prone to intrusions. Being absolutely dead when properly made, and averaging lower in sulphur, electric steel is less liable to show shrinkage cracks between ribs and being more fluid it is not liable to piping or blow holes.

Since electric steel can be made quite hot, a large proportion of the heat can be shanked off with less loss from skulls in the ladles. With acid electric steel it is customary to use lip-pour ladles, but when basic steel is being made, bottom tap or teapot spout ladles are generally preferred so as to prevent contact of the basic slags with the silica of the molds.

Comparative Cost Data

The following figures show present day comparative operating costs for liquid steel in the ladle:

AVERAGE CHARGE FOR TWO TONS OF CONVERTER STEEL DIVIDED INTO FOUR CUPOLA CHARGES

Charge pounds		Cost per ton
912 low phosphorous pig iron	$ 55.00	$22.60
812 Bessemer pig iron	34.00	14.00
1816 steel scrap	30.00	24.30
360 silicon and spiegel	120.00	19.33
333 coke	10.00	1.49
Total cost of charge for two net tons of steel		$ 81.72
For one net ton of steel		45.86
Additions per ton of steel:		
10 pounds 80 per cent. ferromanganese at 15c.		1.50
6 pounds 50 per cent. ferrosilicon at 8c.		.48
1 pound aluminum		.33
Power for blower motor		1.25
Total cost materials and power per net ton of steel		$ 49.42
Average cost of cupola and converter linings		1.20
Labor cost		3.00
Cost of converter steel per net ton		$ 53.62

AVERAGE CHARGE FOR THREE-TON ACID LINED, HIGH POWER, RAPID TYPE, POLYPHASE ELECTRIC FOUNDRY FURNACE

Charge pounds	Price per net ton	Cost for 3 tons	Cost per net ton
6200 machine shop turnings	$ 19.00	$58.19	$19.39
100 mill scale	5.00	.25	.09
60 electrodes	180.00	5.40	1.80
1650 killowatt hour (550 per ton) electric power at 1c per unit	.....	16.50	5.50
20 eighty per cent. ferromanganese	300.00	3.00	1.00
15 fifty per cent. ferrosilicon	160.00	1.20	.40
1½ pound aluminum	660.00	.50	.17
Cost of materials and labor for 3 tons of liquid steel			$85.04
Cost of materials and labor per ton of liquid steel			28.35
Average cost of linings and roofs			.50
Labor cost on furnace			2.00
Cost per net ton of electric steel in the ladle			$30.85

Acid Open-Hearth Practice

The acid open-hearth furnace is still frequently used, generally with oil fuel and mostly in foundries making the heavier classes of steel castings. With the acid open-hearth furnace the standard price must be paid for low phosphorous heavy melting scrap. The fuel oil consumption for such open-hearth furnaces in foundries usually runs from 45 to 90 gallons, costing at the present time from 3,375 to $7.50 per ton of liquid steel. In the largest of the steel foundries, it is true, producer gas is frequently used at less fuel cost. However, the contaminating effect of the sulphur content of the coal and the complications and expense of the producer plant as a rule deters the ordinary steel foundry from using coal as open-hearth fuel.

The great drawback of the open-hearth furnace is its well known inability to furnish steel sufficiently hot to satisfactorily make medium and small castings without undue costs for refractories and largely increased fuel consumption. The inconveniently large heats of the open-hearth furnace, 15 to 40 tons, count heavily against it in small casting work.

As to the most suitable type of electric furnace for installation in the ordinary steel foundry, the writer believes that basic steel will be demanded by many producers, who will then lower their limits of sulphur and phosphorus to a level not practicable to reach with the acid furnace using commercial grades of scrap. At present the call is for acid-lined furnaces, as present specifications are liberal as to sulphur and phosphorous content and high grade shrapnel and other munition scrap is available in large quantities. The acid furnace is simpler, cheaper and faster to operate.

It is strongly recommended that a furnace be purchased so designed and constructed that it is adaptable to basic operation. This means that the furnace shell must be of large diameter and the bath must be of large area and shallow. The furnace should not, in our judgment, be of the long arc type nor of the small diameter shell deep bath type, if the best work is contemplated. Indeed even for acid melting there is a noticeable difference in the quality of the steel obtained from the large diameter, shallow bath furnaces compared with the latter it is not feasible to obtain the same mechanical reactions from the additions put in to refine the steel as when the bath is of the shallower type. Nor is it possible to so thoroughly deoxidize the metal by maintaining the reducing atmosphere in the furnrace.

For foundry work it is especially important to have the furnace constructed with all possible operating conveniences and facilities, so that one heat may follow another with the utmost rapidity and with a minimum loss of time for necessary furnace adjustments. It is therefore important to look carefully to the facilities for making bottom and fettling the banks.

Maintenance Facilities

All practicable facilities must be at hand for maintaining the spouts, maintaining and renewing the roofs and door liners and also for convenience in adjusting the electrodes in their clamps. Suitable apparatus for switching and adjusting the currents and voltages with which it is desirable to operate also should be provided. Practically all modern furnaces are now equipped with automatic regulators, which save a large amount of the attendant's time and do the work better than is possible with hand regulation. The very best facilities should be provided for handling the slag from the furnace and for tapping off the liquid steel. It is the opinion of the writer that the slag can best be handled by tilting down the charging door, that is tilting the furnace backward, so that the slag may be poured or raked off into a covered slag box, where its heat and presence do not interfere with and delay the operation of tapping the steel into the ladle.

It is strongly recommended that the furnace be kept as free from parts of machinery located underneath the shell as possible, for there is nothing that disgusts the operator more than to have a heat of steel cut through the furnace bottom and "gum up" a lot of gears, shafts, motors, etc. It may be argued that a cut-through of the bottom is the result of careless operation, which it certainly is, but it must be remembered that the only safe rule is that whatever can happen surely will happen sooner or later.

From the power station standpoint, which also affects the cost of the power to the user, certain important considerations must be observed. The furnace should be of such size as will enable it to be maintained in practically constant operation, as all power is now sold on a load factor basis, and the more nearly continuously a furnace can be operated, the smaller that proportion of the bill for readiness to serve as compared with the energy charge will become, which means that the average cost of power per unit will be less. The furnace ef-treated and in many cases will replace the saving all the more important.

It is likewise important that the furnace should be operated with the shortest possible periods between heats, for during such periods, the user loses a portion of his demand time, which would increase the readiness to serve charge. Also the furnace lining is cooling down quite rapidly and the electrodes are oxidizing away more rapidly than when melting the charge.

In some cases off peak power is availlable at prices which usually do not embody more than a portion, if any, of the readiness to serve charge. In such cases it is frequently practicable to operate the furnace more cheaply during the off peak periods, such as at night, on holidays, Saturday afternoons and Sundays.

It is quite important that the furnace should operate at the highest practicable power factor which can be obtained without undue disturbance of the power company's load, for by so doing the electrode, transformer, line and generator losses are maintained at a minimum. Engineering skill of a high order is required to forecast and select the best type of equipment, under the many varied power supply conditions which obtain in different localities.

Unbalanced Loads Are Shunned

Power companies without exception dislike to receive a single phase or unbalanced load. They either refuse to handle such a load at all or penalize the user by charging a higher rate. It is, therefore, essential for furnaces above the smallest size, say ⅜ tons capacity or less, to be arranged to receive a balanced polyphase power supply.

It is often asked when the electric furnace field will become saturated and electric furnaces no longer desirable purchases. It is believed the natural growth of the high grade, medium and small size steel casting business will continue for years to come and demand the installation of a large number of electric furnaces.

The electric furnace is making possible the establishment of many small foundries, where heretofore the usual methods of producing steel have been too uncertain, complicated and costly. I believe that high grade steel castings will continue to replace iron castings in increasing numbers. Tractor and truck fields provide a rapidly growing market for such castings. The railroads, tramways, agricultural implement manufacturers, machine tool builders and many other lines of industry are using steel castings in larger numbers from year to year. There is a wide field opening up for alloy steel castings of a grade that can be properly made only from electric furnace steel. Such alloy castings may advantageously be heat treate dand in many cases will replace drop forgings.

ROMANCE OF GAS BY-PRODUCTS

By I. T. H.

There is nothing more remarkable in the fairy tales of industry than the manner in which the Cinderellas have been taken from the kitchen, so to speak, and given precedence over their step sisters. In soap-making, for instance, at one time the soap was the only thing that mattered and the glycerine which was produced at the same time from the fats and oils was run down the drain. Now the soap works are busy night and day primarily making glycerine for munitions, and the soap is almost a waste product. It has been very similar in gas making. At one time the gas liquor with its evil smell was merely a nuisance, now nearly all our ammonia for fertilizing the fields, a large part of our sulphur, and the cyanides for the extraction of gold are obtained from it. Not long ago the recovery of tar from the bottoms of pits and canals, where it had been run to get rid of, was quite a business, but tar now gives us the bases of our aniline colors, many of our most valuable medicines, and even perfume; while the tar oil becomes at the touch of the chemist's wand, lyddite, trinitro-toluol, and similar substances for the terrible high explosives for our shells, mines, and torpedoes. So valuable have the benzol and toluol become that the tar, however carefully it be treated, does not supply enough, and processes have been at work for some time to recover the comparatively small quantities that exist in coal gas itself. So far these methods have been only partially successful. According to a new process, it will be possible to secure about two gallons of benzol and a tenth of that quantity of toluol from every 1,000 cubic feet of gas. The method is simplicity itself. The gas passes through a tower filled with lumps of porous material saturated with oil, which absorbs the whole of the benzol and toluol, and then by the simple application of steam separates them; they float on the top of the condensed water, and can be drawn off ready for use, requiring only to be separated from one another by distillation. The discovery will add very greatly to our resources not only for making high explosives during the war, but also for our rapidly growing aniline dye industry in both war and peace; and later, when our big guns are at rest, it will provide a source of fuel for our motor vehicles.

CATALOGUES

The Armstrong Cork and Insulation Co., Pittsburg, describe their nonpareil high pressure insulation in a booklet recently issued. The desirability of minimizing the loss of heat from steam drums, feed water heaters, internally fired and locomotive type boilers, enamel and japan baking ovens' tanks, breechings, etc., has long been recognized. The advantages of nonpareil insulation for these purposes is dealt with and the reason for its excellence as a heat insulation explained. Its applications to various industries is shown in the half tone illustrations of typical installations.

In Bulletin No. 104 the University of Illinois have published the results of an investigation undertaken to determine the rigidity of riveted joints in steel structures and valuable data have been secured. Tests were made on full-sized members with different connections. The distribution of the stresses in a rectangular frame depends upon the rigidity of the connections. In analyzing the stresses in such a frame it is customary to assume the connections are perfectly rigid. If they are not, it is apparent that the actual stress may not be equal to the computed stress. In addition to determining the rigidity of riveted connections, analyses have been made to determine the effect of lack of rigidity upon the distribution of stresses in a frame.

The Armstrong Cork and Insulation Co. have issued a descriptive booklet dealing with their lineotile floor covering. The floor problem is always a vexing one. Nowhere is it more troublesome than in offices, banks, stores, church lobbies and places of similar character. Similar problems present themselves in the floors of certain rooms in private residences such as billiard rooms and kitchens. To meet need of a floor which would be suitable for such requirements this company has brought out the Linotile floor, a covering which fulfils the requirements of resiliency, silence, warmth, sanitation, durability and cleanliness at a reasonable cost.

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Keep Up That Wall of Steel

THE Germans may talk peace—they may get Austria or Turkey to hoist the white flag—but the shell factory gives the answer of the Allied nations.

Did you hear of any shell contracts being cancelled on Monday morning on account of the German peace talk of Sunday?

Did you hear of the call being any less for 18-pounders, the 75-m.m., the 155-m.m., the 9.2 or the six-inch?

Not a bit of it. The forging and the machining were going on just the same as though there had been no peace talk, and the shipments were going on with the same unfailing regularity.

As a matter of real fact, the Kaiser's peace kite didn't get the eyes of the world long enough to make the munitions workers miss a single operation.

And there's no let up in the Allied programme that calls for more than capacity production of the steel plants of the continent. Every day sees the figures shoved up a few more hundred or thousand tons; every day sees another non-essential line told to suspend operations; every day sees a customer told that there's no steel or iron for him because he's making a line that can wait; every day sees the whole commercial and mechanical fabric of the continent keyed up tighter and harder for ultra-maximum production.

The men who control the steel output of this continent know the enormous tonnage that is being turned out—they know it is a case of steel or men—the more steel the lower the casualties, and they are seeing to it that the wall of steel that precedes the march of the Allies eastward is tremendously efficient and perpetually maintained.

The whole business of the nation has been thrown out of kilter, and it is going to stay out of kilter. The war needs occupy the centre of the arena, and there's no disposition to crowd them to one side.

The Kaiser and his war lords started this war; they lived it years ago; they planned for it and they plotted and schemed for it. But the Kaiser and his war lords are not going to finish this war. That part of the performance is going to be attended to by the Allied nations of a free world.

The Allies are not fighting for the sake of fighting. The lives of their men are dear and precious to them. They will not fight five minutes longer than is necessary, neither are they disposed to cease five minutes before they have accomplished the task to which they have set their hand.

The latest indications from the front should be a challenge to the munitions workers of this continent.

If you are making shells, make more of them and make them better.

You can hasten the end of the war by keeping up that wall of steel that goes on ahead of the Allies.

Don't bother about the Kaiser's peace proposals. The diplomats of the Allied powers are acting in concert and in complete accord, and they are not going to betray the trust that is theirs.

Peace will come, and it may come quickly. Against that is the chance that it may not. Base your efforts on the latter. Better to have a pile of shells left over than that there shall be a break in the wall of steel that the munitions workers are building on that Western front.

THE community is divided into two great classes now, viz., them what's had the Flu and them what ain't.

* * *

THE Kaiser's big job now is not the winning of the war, but saving enough out of the scrap heap to provide underwear and fodder for himself and family.

* * *

THE Toronto "World" announced that the Page-Hersey Co., of Guelph, had secured a large order for 155 H.H. shells. These H.H. shells are something quite new to us. No doubt the H.H. stands for "Hun Hitting."

* * *

IT shouldn't be much of a job to grab the Turkish army if the soldiers wear the sort of trousers the Turks are generally pictured as wearing.

* * *

CIVIC officials used so many civic autos in Toronto going to the ceremony of opening a new road that private cars had to be secured to carry nurses to attend to influenza patients. All the ceremony needed to open the road was a couple of huskies to knock down the barricades.

PLATING AND POLISHING DEPARTMENT

Took an Earthquake to Wake This Firm Up

Maximum Area of Cathode — Plating Machines — Shortage of Apprentices

By ABE WINTERS.

THERE are also scores of plating plants which may be made more efficient by the installation of possibly one or two simple accessories, such as small tanks, extra bus bars or even an ammeter. For example,—suppose you are now processing steel goods and depositing copper and nickel. Is your method of placing the various pieces upon holders such as to permit the maximum surface area of cathode to be suspended in the plating bath at each load? Look over these holders which were designed a few years ago and the chances are you will be able to increase the number of pieces for holder merely altering the design slightly. Look over the plating tanks and possibly you will notice that during the past you have been using a 200 gallon tank with only 160 gallons of solution in it, as it is common practice among platers to keep the surface of the solution from 4 to 6 inches below the top of the tank, yet, we have never met a plater who could give a practical reason why he did so. Frequently the output of a tank may be increased 25 per cent by utilizing this space. We recently inspected a plating plant where a nickel tank was turning out 4 batches of work per ten hours, the foreman was very anxious to increase his output but could not make the firm believe it was necessary to install another tank, at last they insisted upon longer hours and this did not appeal to foreman's taste in the least, so he became busy, told his troubles to another plater and to-day the one nickel tank is producing from 12 to 15 batches of beautifully white, nickel plated steel and iron. The change was effected by increasing the density of the nickel solution from 5 degrees Beaume to 16 degrees Beaume, and removing the antiquated resistance board from the electrical circuit, thus allowing the full power of the small generator to work on the tank terminals. Furthermore this plater succeeded in handling the increased output with less help than had been employed before the change was made. Previous to the confidential chat he had washed the product while contained in wire or stone ware dipping baskets, then the parts were placed on holders and swabbed with a cotton swab, immersed in a dilute hydrochloric acid dip, rinsed and transferred to the plating tank. Under the present system a girl places the pieces of steel or iron upon the holders immediately after the goods arrive in the plating department the loaded holders are suspended in a boiling solution prepared from chemicals having powerful emulsifying properties. Five minutes' treatment is sufficient to free the bulk of the greases from the steel. The holders are then removed and plunged while hot into a 20 per cent. solution of sulphuric acid and water, rinsed and agitated for a few seconds in a 5 per cent. solution of hydrochloric acid, rinsed in cold running water and placed in the plating bath, by this method one man and a girl are turning out over three times the amount of plated work that two men and a boy labored steadily to produce under the slower system. The saving in wages in this case was $3.00 per day or over $850.00 per year, and in a shop where the total weekly payroll is less than $500.00.

Plating Machines

A well designed and simply constructed mechanical plating machine is a wonderful labor saver. With this apparatus it is possible to process thousands of pieces of small or medium sized articles without interfering with the output of larger pieces and with no extra manpower. Platers who have not operated mechanical plating machines are liable to make at least one error when required to operate such devices in a nickel solution plating direct on steel. They almost invariably underestimate the time required to produce a reasonably durable coating of nickel for decorative as well as protective purposes. We find that various manufacturers of mechanical plating machines claim that satisfactory nickel deposits may be obtained on steel in one hour by using certain nickel salts in the preparation of the solution for the machine. "It can't be did," unless one is very easily satisfied and requires the satisfaction to endure for only a very brief period. One firm plates steel units, screws, washers, etc., for two hours, then immerses the plated goods in a hot oil bath, drains the articles quickly and removes the oil by means of centrifugal dryer, the result is a lustrous finish and a surface specially treated to withstand the corrosive action of acid secretions from the hands of the assemblers and ordinary atmospheric influences.

It is not always good policy for a foreman plater to engage too continuously in production, if he is a master of his particular branch of the art it may be possible to successful employ his time in labor without impeding the output, but a working foreman plater seldom reaches the high water mark in efficiency if he has several employees depending upon him for guidance, and at this time electro-plating plants are not overloaded with experienced help.

Shortage of Apprentices

In the September number of CANADIAN FOUNDRYMAN reference is made to the apparent shortage of apprentice molders, the same condition prevails in regard to apprentice platers. It is practically impossible to secure active intelligent young men for apprentices to the platers. The situation is being met by many firms by the employment of female labor and it is problematical as to what the ultimate result will be during the reconstruction period which will follow the close of the present European hostilities. It therefore behooves each and every progressive foreman plater to exert himself during the present time and increase his actual worth to his employer by curtailing unnecessary expense in the plating department. Think as you have never thought before, then act and produce something, you will be gratified as a result of the effort and possibly open the eyes of the boss to the extent of voluntarily increasing your rate on the payroll. Simplify the plating methods, reduce the motions necesary to produce a given amount of finished goods, aim to get the plating tanks loaded at the earliest possible moment in the morning and keep them busy until the hour of closing at night. Endeavor to interest the employees in the process, teach them the fundamentals of electro-plating, demonstrate the difference in results when articles to be plated are clean and unclean, also the necessity of maintaining clean contacts at every point in the electric circuit in fact do not hesitate in giving useful and instructive information relative to the process if you desire the wholehearted interest of your men or women. Possibly you have lost your best man during the past summer and the present help causes you endless worry by night as well as by day. Have you considered the possible effectiveness of a general increase of, say, 5 cents per hour to the really worthy ones and the elimination of the deadwood? If not, think it over, slackers or hangers-on are often expensive handicaps when an effort is being made to push a good one to a point where he becomes a real asset to the company. A man with no experience in plating can be trained to become very reliable in a very short time, and such men, possessing only limited knowledge of the principles of the business, yet, capable of producing satisfactory results by reason of their willingness to receive and obey instructions, feels his position with reference to his employer and usually develops into a careful and trustworthy workman because he realizes he is not rated as an ordinary laborer and could obtain employment elsewhere only as a less valuable man. The foreman or superintendent should invite the confidence of the men and women under his supervision, treat them as responsible beings and encourage them to improve by tactfully explaining the cause and effect when an error results in inferior plating, rather than incur their hatred by loudly and profanely denouncing them as stupid or brainless. In order to systematize the routing of parts through the plating processes and minimize the labor necessary to produce the maximum output, the general factory organization must be such as to allow the foreman plater a fair chance to plan ahead at least one day. The proper installation of necessary equipment solves possibly one-half the problem of plating room economy, the remaining one-half depends upon the foreman if the shop management is consistent in the delivery of goods for treatment and its demands for delivery after treatment.

With reference to general plating practice the shortage of labor in plating plants resulting from abnormal conditions of the labor market owing to the war has acted as an incentive toward improvement in methods, reduction of operations and the gradual elimination of electro-plating as a means of protection for various minor portions of the metal products which have heretofore depended upon a metallic non-corrosive deposit to render them attractive and pleasing to the eye as well as durable in service.

Abe Winters

Oct. 12th, 1918.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1918-1919

President—James Vallier, 701 Crawford St., Toronto.

Vice-President—Charles Kemish, 271 Boston Ave., Toronto.

Sec.-Treas.—E. Coles, P.O. Box 5, Coleman, Ontario.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Questions and Answers

Question.—We have recently become aware of a very great waste of cleaning compounds in our plating department. We are engaged in the manufacture of munitions and copper plate. Certain portions of the pieces are cleaned in boiling solutions of alkaline compounds. We find that an average of three spills per twenty-four hours have occurred during several months. A very conservative estimate of the chemical loss per spill would be five gallons of solution or two and one-half pounds of compound, which costs us nine and one-half cents per pound. At this rate we figure our loss in chemicals during one year would equal approximately $213.00. In addition to this chemical loss our engineer advises us we are losing at least two tons of coal by the waste of steam as a result of additions of cold water to the solutions after each spill, and he suggests the use of exhaust steam as a remedy for the present faulty condition. We wish to enquire if the use of exhaust steam for this purpose has proven satisfactory in commercial plating practice, or is there a more efficient remedy for the trouble?

Answer.—The needless waste of steam, coal and chemicals as described in your letter is occurring every day in practically every plating shop throughout the country. Factory executives have repeatedly been told that such losses were controllable, but seldom interest themselves sufficiently to ascertain even approximate facts regarding the conditions existing in their respective plants and as a result the losses have continued. The waste may be partially controlled by the use of exhaust steam, exhaust steam is utilized for heating solutions in many plating plants but does not eliminate the losses referred to. In many plants the live steam delivered to cleaning tank coils furnishes approximately 349° Fahr., while the maximum steam heat required in the coils is 212° Fahr. Therefore, 137° Fahr. in excess of requirements are needlessly present. In such cases exhaust steam at 5 lbs. pressure could be used and the steam delivered to the coils would approximate 227° Fahr. or only 15° in excess of actual requirements. A reduction in radiation losses would be effected and the saving of coal would naturally result. A reduction of the live steam pressure to the plating department, together with suitable covering on all steam pipes would prove an economical move, but to absolutely control the loss of solutions, steam and coal you will find that the installation of thermostatic regulators will be necessary. To employ these instruments it will be necessary to reduce the steam pressure to 25 lbs. or less. There are at least three different firms who manufacture reliable devices of this kind. Spills are impossible with these instruments in the tank. The temperature of the solution is maintained continuously uniform during the hours of operation. The value of thermostatic regulation of temperatures has long since been acknowledged by various authorities and the principle is employed in various industries.

* * *

Question.—One of my nickel plating solutions produces pitted surfaces. I have tried to avoid the pitting by following instructions published in the CANADIAN FOUNDRYMAN, but the pitting continues and is becoming more serious every day. Please inform me of remedy which will save this solution, as I cannot induce the firm to throw it away.

Answer.—Your firm is very sensible in refusing to allow you to throw the nickel solution away simply because it produces pitted deposits. If all manufacturers tolerated such remedies for plating room troubles the supply houses would surely control the situation and electro platers would become mere machines. Do not allow yourself to be beaten by a solution over which you have supervision. Master the composition of the solution which you use, study the reactions which occur during the operation of same, and by close observation and experience you will soon learn that a truly skilled electro-plater does not consign the abused or ill-used solutions to the sewer. Your trouble, doubtlessly, originated in neglect. The nickel solution is evidently depleted of metal, possibly you have relied upon hydrometer readings for guidance and the high acid content has deceived you. For a double sulphate solution try the following. Neutralize the bath by adding plastic carbonate of nickel; then add at least 3 oz. of single nickel salts per gallon of total bath; when thoroughly stirred, test for acidity; if too acid, use more carbonate. When nearly neutral. add from 2 to 3 oz. of boric acid per gallon. Dissolve the boric acid in a portion of the solution by heating with steam. Operate the bath with an anode surface in excess of the cathode surface and do not attempt to force the deposit by employing high current densities, as an excess of hydrogen is then liberated and pitting will occur. Pitting is indicative of waste electrical energy, or in other words you are depositing hydrogen instead of metal with a larger percentage of the current than is necessary under normal conditions.

* * *

Question.—We have experienced considerable difficulty in copper plating soft soldered joints on various steel pieces which we manufacture. Can you advise us how to successfully copper such surfaces without extra expense?

Answer.—Soft solder or other soft metal surfaces may be successfully copper plated in a cyanide copper solution operated warm and possessing a normal metal strength. The solution should not contain appreciable quantities of sodas, such as hyposulphite, bisulphite or the carbonate, if perfect success is desired. The important point to remember in copper plating soft soldered surfaces in cyanide copper solution is the proper regulation of electrical current. Too strong current will cause blisters. Reduce the current immediately the surface of cathode is covered and finish the deposition with as low current density as permissible with your rheostat. If you find this procedure requires too much time to obtain the required deposit we would suggest transfering the pieces to an acid copper solution after securing a preliminary coating in the cyanide solution.

* * *

Question.—I have recently prepared a nickel solution by using both single and double nickel sulphates together with magnesium sulphate and boric acid I find that while my double sulphate solutions produce good deposits in one hour when operated with 1½ to 2 volts, this new solution will not produce a deposit which I can consider superior in the same time at same voltage. Can you assist me in obtaining better results from the new bath?

Answer.—If you have an ammeter, connect the instrument in the new tank circuit and you will find that the current density you are using in the new bath is greater than the current density permissible in the old solutions with same cathode surface area. Furthermore, if you increase the voltage at the new tank you will find it possible to produce better deposits in much less time than 1 hour. We assume you have prepared a solution of greater concentration than is possible when only double sulphates are employed, otherwise our deductions are incorrect.

* * *

Question.—Will you kindly inform me of some chemical or the formula for some solution which can be used as a substitute for potassium sulphurette in the process of oxidizing copper or silver. Barium sulphide will not produce the finish required by our customers.

Answer.—There are two preparations which are in general use, each giving excellent satisfaction. Polysulphide is procurable from the U. S. manufacturers and leoxide (liver of sulphurite) is obtainable from Canadian platers' supply houses. The latter is a very efficient material and is extensively used by colorers of electrical fixtures, etc. One ounce per gallon of water will usually produce the desired finish. The results may be altered by changing the temperature of the solution rather than by increasing the quantity of the chemical per gallon of water.

* * *

Question.—I have recently assumed control of a plating plant and my knowledge of the various solutions is rather limited. At present my only worry is relative to a mechanical nickel plating machine and the deposits obtained from the solution it operates. The machine has been employed continuously every day for the past four months plating small steel and iron pieces. A few days ago I loaded the cylinder with small brass wing nuts; the usual time was given for the deposit, but the entire load was of a color similar to gun metal, a semi-brilliant grey. Several attempts to produce satisfactory white deposits on brass have failed, although the machine yields deposits on steel which are apparently of the usual thickness, white and bright. Has foreign matter accumulated in the bath sufficiently to produce the effect described? If so would you advise throwing the solution down the sewer?

Answer.—You will not assume control of the plating plant until you have mastered the various solutions, operations, etc. At present you have charge of the department and by interesting yourself in each difficulty as it appears you will rapidly acquire control. The nickel solution which is the suorce of your present concern is not contaminated, at least not sufficiently to warrant discarding it. The present condition of the solution is due purely to neglect. A simple test with litmus paper and hydrometer would have been sufficient to warn you of impending danger. Tests should be made once each week or oftener if possible. The solution is alkaline and very deficient in metal. In this condition it is possible to produce deposts on steel which to all appearances are splendid, yet the same solution will not yield a white or brilliant deposit on brass at any temperature or by increasing speed of rotating cylinder. We assume that your tank contains approximately 80 gallons of nickel solution, and will venture to say the solution does not turn blue litmus red or purple, but instead it turns red litmus paper blue, showing alkalinity. Furthermore, we venture to judge the metal content very low and the solution will probably not register more than 3 or 4 degrees on a Beaume hydrometer, calibrated for heavy liquids. If our deductions are approxmately correct, add to the solution by heating sufficient quantities of both single and double nickel sulphates to produce a solution which will register at least 10 degrees Beaume; then test the solution for acidity and add sufficient sulphuric acid to cause the solution to turn the blue litmus paper a pale red. If the deposits are required to be exceptionally bright, add 3 oz. of boric acid and 2 oz. ammonium chloride per gallon of total bath. With a solution of this composition you may find it necessary to either reduce the speed of rotation or the time of deposition on certain loads of work, as the solution will deposit nickel very rapidly and on some pieces the result may be disastrous unless the above mentioned features of the operation are given proper consideration and attention. Generally speaking, the results should be highly satisfactory with a minimum of supervision.

* * *

Question.—Our factory has had some difficulty in plating steel cups, which previously had been through a soldering operation. The acid, it appears, entered the pores of the metal and rust came through the plating after the cups were finished. Would you be kind enough to give us some advice on this subject through the columns of your journal to which we are now subscribers? Plating steel, we presume, is not satisfactory wherever the article is to be subject to any kind of moisture. In this case we believe our plating department did not remove all the acid from pores of the metal. Is there any way in which this department can determine the presence of acid in the metal, and what solutions would you recommend to remove this acid?

Answer.—It is common practice with several firms to place small steel pieces in a strong solution of soda ash immediately after the soldering operation and allow the pieces to remain covered with the solution until a considerable quantity are ready to be given further treatment. If the operations prior to plating and following soldering require more than a few hours, the steel is dried by passing through boiling water and is dipped in a thin non-corrosive oil and drained. If the plating operation is performed within an hour or so after soldering, the pieces are taken from the soda ash solution and transferred to the cleaning solution used for treating general run of steel for plating. Such cleaning solutions are usually maintained sufficiently alkaline to neutralize the acide remaining in the pores of the metal. This is particularly true with reference to sheet steel stampings or forged steel. Naturally we may expect the alkaline cleaning solution to become neutralized in time by this method, and additions must be made to the cleaning solution at frequent intervals. With expert manipulation of the soldering medium and the judicious application of the soldering flux or acid the actual amount of acid remaining on the parts is very small and requires no special treatment to avoid difficulties such as you have experienced. We are of the opinion that rust was present on the steel cups before they were plated, unless the alkaline cleaning solutions used were practically exhausted. You do not state the nature of the metal deposited upon the steel. If it be nickel and the nickel is deposited directly upon the steel, you no doubt use an acid dip prior to plating. It is possible to produce conditions by the improper use of such dips, which result in defective nickel deposits. Hasty, imperfect rinsing is another cause of similar trouble. If you copper or brass plate the steel cups we assume you are using a cyanide dip prior to plating; if so, the cyanide solution must be strong enough to neutralize the acid or the dip acts merely as an added hindrance to good results. A weak cyanide dip is a constant source of trouble when used for treating steel prior to plating. Keep the dip at from 3° to 5° Beaume for lengthy treatment of steel and at least 8° Beaume for short treatment. If you are using one of the various mild cleaning compounds now so common in commercial plating practice we would advise adding about 4 oz. of soda ash to each gallon of the solution and shorten the time previously allowed for cleaning. If you have the necessary equipment for an electric-cleaning tank you will find the electric cleaning process a great advantage. The physical action in combination with the chemical action of the solution will effect a positive elimination of all acids from the pores of the metal. The compound you have ordered will answer very satisfactorily providing you do not use over 4 oz. of the compound per gallon, make frequent small additions to maintain a uniform action. If you wish to test the steel for acid before plating, rinse a piece in clean cold water and apply blue litmus paper to the surface. If acid is present in the pores of the steel the paper will turn purple or red. Steel surfaces may be electro-plated so as to withstand very severe moisture conditions if the preparatory treatment is carefully performed and the metallic coating is reasonably thick and uniform. Commercial plating as produced to-day is practically useless when subjected to even ordinary atmospheric influences. With the exercise of a little care and the application of plating fundamentals you will free yourselves of your present difficulty.

AVOIING SHRINKAGE TROUBLES IN CAST IRON

CAST iron shrinks approximately an eighth of an inch to the foot. This means that a straight bar a foot long will shrink an eighth of an inch in cooling, but if melted cast iron is poured into a complicated shape, it is a hard matter to tell how it is going to shrink. If the casting is unevenly proportioned the lighter parts will cool first and warp the casting, and the heavier parts in coolling might spring the casting in some other direction, or possibly the part which cooled first will have sufficient strength to rupture the heavier part while it is yet soft, or perhaps it will remain in its proper shape, in which case there will be an enormous strain on some parts making it more likely to break than if the parts had been uniform.

Another characteristic of cast iron is that a casting though evenly proportioned and of plain design will shrink unevenly on account of the way it cools. A plain flat disc, poured in open sand will cool at the outside first and continue cooling from the outside towards the centre. It will be easily seen when the outside edge becomes set, that the centre part which is still soft must either crack or else warp the casting when it comes to shrink. If it should crack, the opening will be greatest at the centre, and diminish towards the outside. If it does not crack, the outside will probably raise, but sometimes it will be the reverse. The reason is that the hard outside rim can not be made to contract so as to allow of contraction at the centre, but it must yield some way or else the casting must crack.

In cases of this kind, the difficulty can usually be overcome by piling a considerable depth of sand on the rim, and reducing the depth of sand towards the centre, thus giving the centre a better chance to cool. Similar results can be obtained by covering the casting evenly with sand and then uncovering two strips at right angles to each other the entire diameter of the casting and crossing at the centre. This uncovers the centre in greater proportion than the rim. In casting bulkly pieces, a different course of procedure is necessary. The entire surface sometimes cools and sets, leaving the inside in a molten state, but if it is very bulky, it will remain melted long enough to let the top settle to some extent before it sets. But in any event the inside will remain liquid until the last and will of course shrink unless sufficient metal is supplied to prevent it. This is done by placing a riser on top of it and feeding it, and unless properly done this will not always produce a sound casting. It is amusing to note the ideas advanced by some foundrymen.

In addressing a meeting of the British Foundrymen's Association recently, the president of one branch of the organization asked the question, "Why does the inside of a casting which is freezing under pressure from the solid and contracting outside, have a coarser grain than the outside that solidified under practically no such pressure?" From this he evidently thinks that while the inside is still liquid, the outside becomes set, and proceeds to contract and close in on the liquid metal inside, and according to his expectations crush the grains up tight together. Perhaps it does, but it will be only for a short time. Certainly the casting will cool from the outside but by the time the outside is cold enough to be unyielding it will have done most of its contracting, and the inside being still liquid will yet have to contract, the very reverse to the theory that it will be crushed from the outside. It is here that the feeding rod is of value. If a riser is placed on top it will likely set before the casting does and will bleed the casting, doing more harm than good, but by using the rod the riser is kept open, thereby allowing fresh metal to go down, replacing what has been drawing away by the contraction.

To do a good job of feeding the pouring should be stopped as soon as iron starts up the riser, and no feeding should be done until the riser's almost set, when it should be filled to the top with the very hottest of iron, after which by inserting the rod, and working it up and down, we don't so much feed the iron into the casting as we keep an opening through which it can find its own way into the proper place. Knowing as we do that the centre is the last to congeal, we must feed deep enough to be sure that we reach the last soft spot. It is a mistake to put dull iron into a riser. Nothing but the hottest iron should be used, and when this no longer find a place we may feel confident that we have done a good job.

Another argument which I have seen discussed to some extent but have never seen satisfactorily answered is that of placing more than one riser on a casting. Some will argue that one riser is enough for any casting, no matter how big, unless it has heavy parts separated by lighter sections. In such case one riser would be placed on each heavy part. But for a casting such as a balance wheel, one would be sufficient, basing their argument on the grounds that if two risers are placed on opposite sides and only one is fed the iron will bob up and down in the other, indicating that none is being forced into the casting. I cannot agree with this idea. So long as the iron is hot enough to bob up and down there is very little to be gained by feeding any of the risers, but as soon as the metal begins to congeal it should be fed, and the hot iron being fed in at the riser will naturally keep that vicinity a little hotter than the rest and it will probably not affect the opposite side the same. I think it possible to go to extremes in this as in other matters, but still I would not like to trust too big a piece to one riser.

◆

Gage glasses are very susceptible to surface abrasions, even so minute as to be unobservable. If one receives the slightest scratch inside or out, it should not be used, and in handling or keeping them in stock, no metal of any nature should be allowed to come in contact with them. They are particularly liable to break if iron or steel touches them and should never be laid even temporarily with tools, as is frequently done.

◆

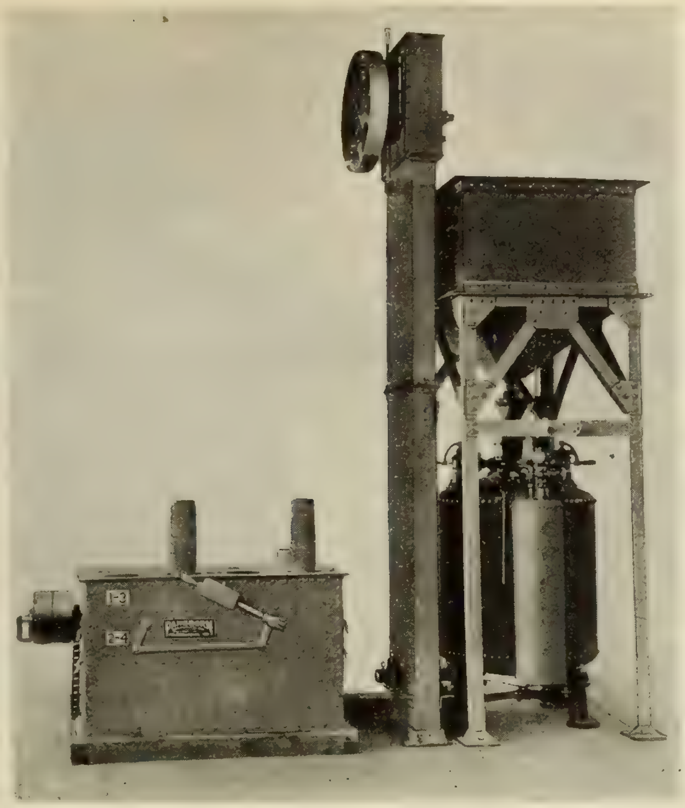
The United States Silica Co. have recently issued a descriptive booklet of their various products enumerating the excellent qualties of flint shot and illustrated by a number of excellent drawings, which effectively drive home its advantages. Flint shot is extremely hard and effects a considerable saving in freight, air and labor, and may readily be used on castings of any material, forgings, stampings, hot rolled bars or sheets.

◆

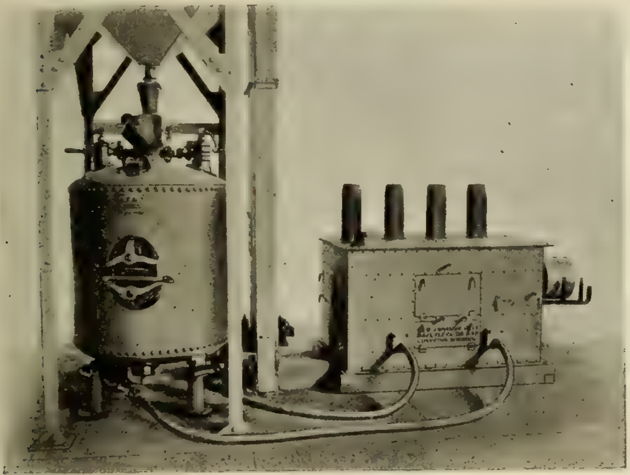
Montreal.—The work of completing the construction work of LaSalle bridge, which has been long delayed, is to be undertaken by the city at once. The City Council has decided to award the contract to Fraser, Brace and Co., whose tender for $6,000 was the lowest submitted. The highest tender demanded $20,000 for the supervision work.

AUTOMATIC SHELL CLEANING CABINET SAND-BLAST

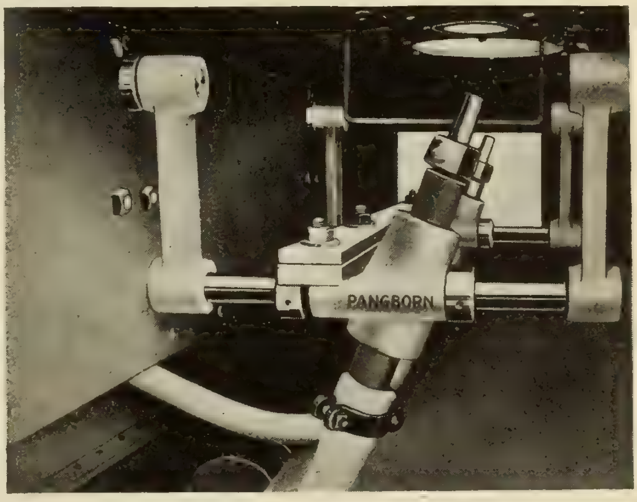
This machine is designed to provide continuous operation for cleaning 155 mm. shells with direct high pressure. Primarily it consists of a cabinet in which are mounted four rotating chucks driven at slow speed on dust proof ball bearings. The chucks are driven by a belt from a main drive gear at the rear of the cabinet, and alternate chucks revolve in opposite directions. All driving gears and mechanism are contained in a separate dust tight compartment. A direct high pressure sand-blast machine supplies two lines of hose feed, two nozzles which are positioned to project within the nose openings of alternate shells. The shells are placed in the rotating chucks opening downward, and as the two alternate shells are cleaned, the nozzles are thrown by a lever on the front of the cabinet to the other shells without stopping the blast action while the clean shells are removed and others placed in the chucks for cleaning.



SAND BLAST MACHINE FOR SHELL CLEANING

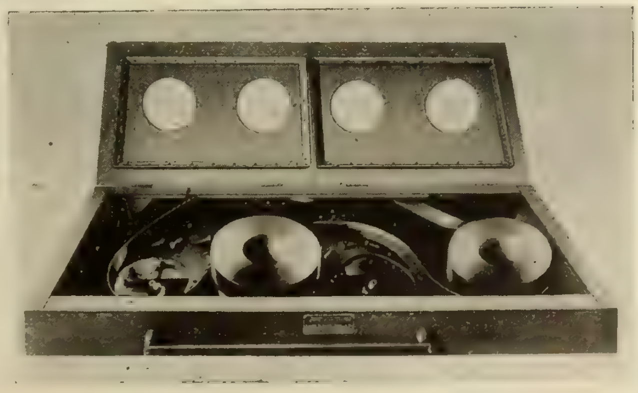


REAR VIEW OF MACHINE



DETAIL OF SAND BLAST NOZZLES

A hopper formed in the bottom of the cabinet receives the spent abrasive which is conveyed to an elevator and rais-to an abrasive separator over the sand-blast machine, which by mechanically operated screens and strong exhaust, at one operation removes both fine and coarse material which passes to a refuse bin, the clean, sharp abrasive for refuse being delivered to a storage bin for refilling the sand-blast machine.



SHOWING REVOLVING SHELL HOLDERS

The shells are simply placed in the chucks, which are so designed as to firmly hold the shells in position without other support or attachment, which leaves the top of the cabinet entirely free for manipulation and observation of the shells.

The sand-blast machine can be used with either sand or the metal abrasives, and the equipment in actual practice is cleaning 90 155 mm. shells per hour. The cabinet is also made for other size shells. The illustrations attached show the detail of the chucks and the driving belt, two of the chucks being removed and the nozzles seen through the openings. The lower illustration shows the hose connection to the nozzles and their method of movement by the lever handle on the front of the cabinet, and a section of the conveyor can also be seen in the bottom of the separator. This machine is manufactured by the Panghorn Corporation, Hagerston, Md.

◆

Food Controller Hoover told at a meatless-wheatless banquet a story about a poultry profiteer.

"A lady entered his shop," said Mr. Hoover, "and asked the price of chicken."

" 'Them birds in the winder,' said the profiteer. 'Waal, I can't let 'em go for less than 94 cents a pound.'

" 'Indeed!' said the lady. 'Did you raise them yourself?'

" 'Yep,' said the profiteer, absently. 'They were 70 cents yesterday.' "

◆

How She'd Changed

"It looks as if Jones is better satisfied with his wife."

"Yes, he is. You see, he went back home on a visit and saw the girl he had been dreaming of for the past twenty years."—Life.

HIGH-SPEED SHAPER

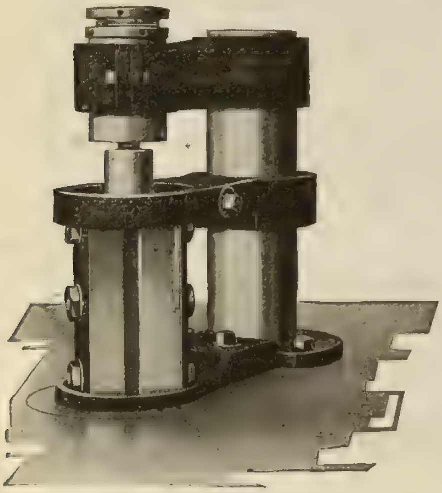
THE high-speed shaper illustrated is manufactured by the Oliver Machinery Co., Grand Rapids, Mich., and is well adapted to rabbeting, grooving, fluting, routing or shaping of any description.

The tables are large, very rigid, planed, and then accurately ground by a special process. They are bored out and fitted with three sets of rings, and are drilled and tapped for the guards.

The spindles are tapered and are made of high carbon crucible machinery steel ground perfectly true on dead centres; guaranteed to run true. The spindles are regularly furnished to "run out."

The bearings are made of bronze, conical in shape, and are surrounded by oil chambers which lubricate the spindles the entire length of the bearings. The bottom of the spindle rides on a copper adjustable step, which is constantly washed with oil. A large brass drip cup catches the waste oil from the upper bearing. All adjustments are extremely simple.

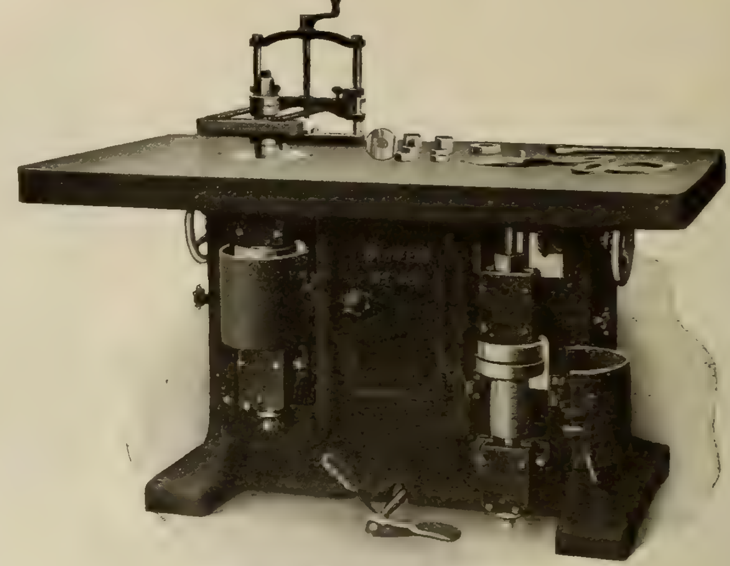
Pulleys are carefully balanced, and are of the pneumatic type. The yokes are raised and lowered by means of the hand-wheels at the side of the machine, there being sufficient vertical adjustment to raise the spindle above the table or lower it beneath the tables. These yokes are very rigid and the screws for raising or lowering are directly in the rear of the spindle, affording them a direct support.



EXTRA TOP BEARING.

The top bearings, with guides and supporting brackets are designed and particularly adapted to auto body or similar work. Top bearings are made of bronze and are adjustable. If desired these brackets can be furnished without the guides for furniture or column work.

A quick adjusting shaper guard is regularly furnished with each machine. Additional guards may be secured any time, as the tables are drilled and tapped for two guards. As shown by the illustrations, these guards are adjustable in all directions and are never in the way.



HIGH SPEED DOUBLE SHAPER.

COMPRESSED AIR SOÇIETY DEFINES TERMS

Upon the recommendation of its technical committee this society has adopted the following definitions of certain compressed air terms in order to eliminate confusion as to their exact meaning.

Displacement.—The displacement of an air compressor is the volume displaced by the net area of the compressor piston.

Capacity.—The capacity should be expressed in cubic feet per minute and is the actual amount of air compressed and delivered, expressed in free air at intake temperature and at the pressure of dry air at the suction.

Volumetric Efficiency.—Volumetric efficiency is the ratio of the capacity to the displacement of the compressor, all as defined above.

Compression Efficiency.—Compression efficiency is the ratio of the work required to compress isothermally all the air delivered by an air compressor to the work actually done within the compressor cylinder as shown by indicator cards, and may be expressed as the product of the volumetric efficiency (the intake pressure and the hyperbolic logarithm of the ratio of compression) all divided by the indicated mean effective pressure within the air cylinder or cylinders.

Mechanical Efficiency.—Mechanical efficiency is the ratio of the air indicated horse-power to the steam indicated horse-power in the case of a steam-driven, and to the brake horse-power in the case of a power driven machine.

Overall Efficiency.—Overall efficiency is the product of the compression efficiency and the mechanical efficiency.

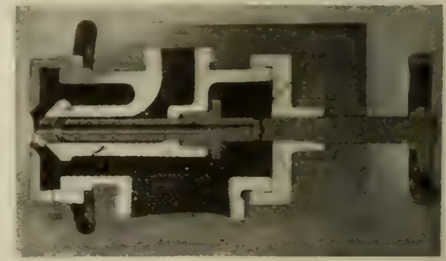
The society further recommends that the use of other expressions of efficiency be discontinued.

◆

OIL BURNER

To obtain the best results from fuel oil, it is essential that the right kind of burner be used and it be properly installed. An oil burner in order to give satisfaction in operation, should be designed with the following features: to secure thorough atomization of the oil, to operate without causing oil opening, to be under complete control of the operator. The oil burner illustrated herewith has been designed by the Foundry Equipment Co., Cleveland, Ohio, with these points in view.

The Coleman Oil Burner is unique in the manner in which the oil is atomized and mixed with the air. The air is sent from the main air chamber to a hollow brass stem. The oil is sent around this circular stream of air, and at the end of the brass stem, which controls the air supply, the oil is forced into the air stream at sharp angles. This causes a breaking up of the oil into small particles and produces a primary mixing with the air. A second and outer stream of air, cutting through the primary mixture, produces a further atomization and furnishes the proper combination of oil and air for complete combustion.



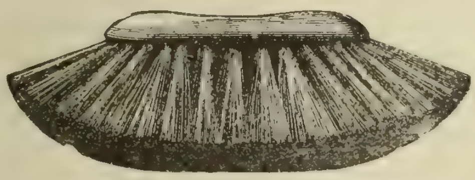
SECTIONAL VIEW OF OIL BURNER

The burner connections provide for a one-half-inch oil line, 2-inch air line, giving a wide range of both oil and air.

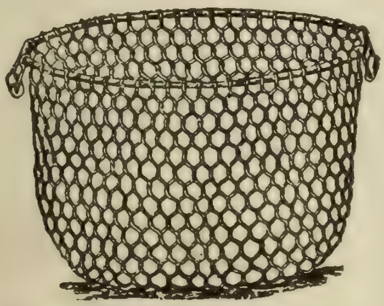
Perhaps the most interesting feature in connection with this burner is the double mixing of air and oil which takes place in the burner. This is due to the arrangement by which a circular stream of oil flows between two air supplies, one on the inside and one on the outside.

These Foundry Ladles are flat bottom riveted steel bowls with forged lips and vent holes.

Bench Rammers as illustrated are made from maple hardwood, thoroughly oiled, 13" long by 4½" diameter.



Moulders' Soft Brushes as above are made from the best quality pure Russian bristle, four inches in length, wire drawn. The block is in two pieces, glued and screwed together.



Coke or Charcoal Baskets of heavy woven galvanized steel wire are strong and durable.

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Foundry Facings and Supplies

Exceptional facilities enable us to make quick deliveries from complete stocks.

Ceylon Plumbago No. 101

No better Facing used anywhere than this high-grade "Hamilton" product. Give it a trial.

Ceylon Plumbago No. 206

Used with unequalled success for General Machinery Castings. Put it to the test.

Use our Black Core Compound and you'll have a strong and lasting defence against core room troubles. It is 100% pure.

Special Stove Plate Facing has proved itself superior by a thousand actual tests.

Our Parting is always uniform in quality. It is giving complete satisfaction in many Canadian Foundries.

The Hamilton Facing Mill Co., Ltd.

Head Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	30 00
Copper, electrolytic	30 00
Copper, casting	30 00
Lead	10 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	100 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$20 00
Copper, crucible	24 50	24 50
Copper, heavy	24 50	24 50
Copper wire	24 50	25 00
No. 1 machine composition	22 00	22 50
New brass cuttings	16 00	15 00
No. 1 brass turnings	15 00	18 00
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	22 00
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	20 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	35 00	33 00
Malleable scrap	21 00	20 00
Pipe, wrought	22 00	17 00
Car wheels, iron	38 00	30 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	30 00	20 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	8 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$14 35
5-16 in.	13 85
⅜ in.	13 50
7-16 in.	12 90
½ in.	13 20
9-16 in.	13 20
⅝ in.	12 90
⅞ in.	12 90
1 inch	12 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 55
Solder, guaranteed	0 60
Babbitt metals	18 to 70
Soldering coppers, lb.	0 64
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	....	10 70
Premier, 10¾ oz.	....	11 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$13 00
3-16 in.	12 50
¼ in.	11 75
5-16 in.	11 40
⅜ in.	11 00
7-16 in.	10 60
½ in.	10 40
⅝ in.	10 00
¾ in.	9 90

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.58 to $0.65
Copper	.36 to .46
Tin	.70 to .70
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, hydrofluoric	.14½
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.22
Ammonium, carbonate	.33
Ammonium, chloride	.40
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.15
Caustic soda	.17
Copper, carbonate, anhy	.75
Arsenic, white	.27
Copper, sulphate	.22
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel sulphate	.35
Potassium carbonate	1.80
Silver nitrate ....(per oz.)	1.15
Sodium bisulphite	.30
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.50
Sodium cyanide, 98-100%	.38
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.85
Zinc chloride	.90
Zinc sulphate	.20

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.		$3 25
Polishing wheels, bullneck		2 00
Pumice, ground		07
Emery composition	10 to	6- 9
Tripoli composition	06 to	9-10
Rouge, powder	.30 to	.35
Rouge, silver	.50 to	.55
Crocus composition	08 to	8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 3
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	45
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

In the matter of placing war orders for steel the Government has certainly shown no signs of relaxation for, if anything, orders have been heavier since the German peace drive started than the average of preceding months. Three large batches of orders for sheets have been distributed, making the buying the heaviest for months. Recent orders include 32,000 tons of 80-pound rails, for General Pershing, together with 150 locomotives. The 40,350 cars for General Pershing, on which bids were recently taken, are likely to be allotted shortly and the filling of the orders may further delay completion of the 100,000 freight cars which have been on order for domestic roads for several months.

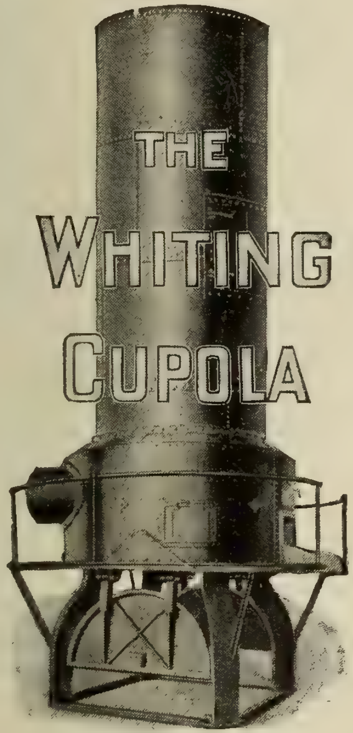
Shell Steel

Fresh pressure is being exerted to secure still more shell steel. One important wire producer in the Pittsburgh district, which was kept off shell steel business for a long time on account of the need for its wire products, began making shell rounds a trifle over a month ago on one of its continuous billet mills formerly serving its rod mills, and this interest has now been asked to increase its shell steel production by

We are prepared to supply Cranes of all descriptions.

Write us if interested.

Cupolas



The Cupola with the reputation. Prices and data gladly supplied.

Ladles

All sizes and kinds handled by us

Air Hoists

If you require and want the latest let us send you printed matter at once.

We also handle all other Foundry equipment manufactured by Whiting Foundry Equipment.

The Dominion Foundry Supply Co., Limited

(Everything for the Foundry)

TORONTO **MONTREAL**

40 per cent. A little information has leaked out as to the actual tonnages of shell steel produced. It appears that in the early months of the year the total production was running at the rate of about 350,000 tons a month. The rate increased until recently it passed 500,000 tons a month, and a rate of 600,000 tons is expected to be attained this month or next. The indication is that the total shell steel output in the calendar year will be about midway between 5,000,000 and 6,000,000 tons. At 600,000 tons a month the output would represent approximately 18 per cent. of the total finished rolled steel output. The proportion of the ingot output involved in making shell steel is considerably larger than 18 per cent., by reason of the heavy discard required, but in practically every instance all the discard steel that can possibly be utilized is rolled into one finished form or another, chiefly for war purposes. The War Industries Board for several months past has been keen to find war uses for shell discard steel and has been quite successful. As a rule, when fresh orders are given a mill to roll shell steel, orders are given at the same time for the utilization of the discards, and only the material that cannot be rolled goes back to the open-hearth furnace as scrap.

Scrap Supplies Slightly Better

Reports from consumers in the past week are of slightly better supplies of scrap. The mills still claim they are very short of scrap, but on the whole the situation is a trifle easier. One theory to account for the improvement is that many railroads, finding labor so scarce, have adopted a practice of selling their scrap as gathered, without attempting to sort it, and this gets the material into the market sooner, though, of course, the supply in the long run would not be increased by the new practice. The Pennsylvania Railroad continues to sort and grade its scrap, and has been canvassing consumers with a view to their making contracts to take offerings in one grade or another, the contracts to run for three to six months. Hitherto the system has always offered its accumulation monthly, as a fresh offering. Another observation made as to increased supplies of scrap is that with the heavier deliveries of cars and locomotives to the railroads the roads are scrapping more old equipment. The scrap dealers have been thinking rather keenly on the subject of peace and recognize that when peace comes consumers of scrap will be prompt to "get back" at dealers for the trying experiences they have had, particularly in the matter of dealers holding extremely indifferent grades of scrap at the full heavy melting steel price of $29 delivered, material which mills say would frequently not bring $10 a ton in ordinary times. Just now, with all mills striving for the last possible ton of output, they are forced to buy the scrap that is offered, but when opportunity comes to let down on the pressure their policy in the matter of buying scrap will be quite different.

Priorities for Controlled Consumers

For several weeks past the conservation division of the War Industries Board has been making agreements with various manufacturing consumers of iron and steel, whereby these consumers would limit their operations to certain rates, based on former practice. In many instances the arrangement has been for the consumer to operate during the last four months of this year on an average, at not to exceed one-half the average rate in a four-month period in 1917, i.e., production in the four months to be "50% of four-twelfths of the production in 1917." In the majority of cases these manufacturing consumers had no definite prospect of getting any steel, under the present regulations, to operate at all, and questions have been asked whether they were to be given any assistance.

The War Industries Board has now undertaken to grant certain priorities to manufacturing consumers who have entered into these arrangements. The degree of priority that will be given is not announced, but whatever it is it will be helpful to consumers who otherwise would have no claim for steel except through their being on the preference list. With nearly all the mills the priority orders are absorbing the output, leaving nothing for the preference list. The agricultural implement trade is an exception to this practice, as it already has B-2 priority, given as "automatic priority" in circular No. 4 of July 1 last. This industry is limited to a 75 per cent. operation in the twelvemonth beginning October 1, 1918.

When Peace Comes

There are very few in the steel trade who think that the diplomatic interchanges of the past fortnight indicate a balance of probability that peace will come in the near future. The strongly preponderating feeling is that there is several months of hard fighting ahead, the actual time on the calendar depending largely upon weather conditions, which will determine how much of the fighting can be done this winter.

TORONTO MAN BELIEVES HE HAS NOW SOLVED THE MAKING OF THE CAST SHELL

A SHELL that would require no machining of any kind, but would come from the mould practically ready for filling, would reduce the cost, and increase the output of shells enormously. If this shell should be cast from a mixture of semi-steel that made a metal of perfectly homogeneous structure, with an even distribution of its component parts, and giving high tensile strength, a revolution in shell making might be anticipated.

Such were the thoughts animating J. C. McLachlan, of Toronto, when the shell industry was getting well under way in the first year of the war. He began to work on the idea about three years ago, and first experimented in moulding, to overcome the difficulty of keeping the core perfectly central in the mould, to ensure the walls being of even thickness. This was not achieved without a long course of experimenting, but finally he succeeded in turning out a perfect shell. Then began the usual vicissitudes of the inventor, the British Government were approached first of all, through their Canadian agents, but they promptly turned their eyes against it, as they would not consider any shell made from cast metal, their objection being that a casting would not stand the shock of the firing charge, resulting in the shell bursting as it left the gun.

Given A Test

Mr. McLachlan succeeded in getting the ordnance department in Quebec to make a practical test, by firing some of the shells, the test demonstrating that the shells could be fired without any danger of fracturing. Nine shells in all were fired, and afterwards recovered, none the worse for their trip. About this time the inventor was getting in touch with the U. S. Government, and incidentally, got in touch with the German spy system.

How Germans Worked

The U. S. had not yet got into the war, but Mr. McLachlan received a message from a man in New York, offering him all his expenses to go down there and demonstrate the making of an 11-inch shell. As he did not wish to go to the States at the time, he suggested his correspondent should come to Canada. This met with refusal at once, and offers of still more liberal treatment. Finally he decided to go and see what was doing. He met his client, who called himself Grey, and was dressed in the height of fashion, and carried as much ready money as the Bank of Montreal. Mr. McLachlan was entertained royally, and it was arranged he should get the use of a small foundry cupola, and make an actual shell. While arranging for this, the U. S. declared war, and Mr. Grey vanished. It was then that Mr. McLachlan found that the Allies did not use 11-inch guns, but the Germans did.

French Government Using Shells

Mr. McLachlan submitted his shell to the French Government, and they tried it out successfully, and have been using it in considerable quantities for some time. Mr. McLachlan has not as yet made anything financially from his invention, but he is not worrying over that. The U. S. Government have now taken up the shell, and have drawn up specifications and sent them out broadcast to Canadian as well as U. S. foundries. It is therefore quite likely that in the near future the manufacture of these shells in Canada will be an accomplished fact. Probably the British Government may then look further into the matter.

YES, and not only a smile, but a *continuous* smile in which your entire organization will join you—for

DIAMOND GRIT
OR
CHILLED SHOT

makes you forget that there ever was such a thing as sandblasting troubles.

It eliminates dust—saves time—saves expense—saves storage space.

One bag of Diamond Grit or Chilled Shot will last as long and do more work than 100 bags of sand.

What it HAS Done:

(1) Six bags of Diamond Grit cleaned 2,000,000 pounds of brass castings.

(2) $67.20 covered the cost of cleaning 1,000 tons of malleable castings with Diamond Grit.

(3) In a New England foundry, one ton of malleable castings was cleaned at a cost of less than two cents.

We shall be glad to cite other interesting instances to you.

May we send you free samples?

HARRISON SUPPLY CO.
5 and 7 Dorchester Ave. Extension
BOSTON, MASS. U. S. A

Producers Want to Know Where Pig Iron Goes

A Very Close Watch is Being Kept to See That War Orders Have a Preference in the Matter of Distribution—Questions That Are Asked

NO. It's not an easy matter for us to keep going. We have a fairly large stock of material on hand, but it's going down rapidly. Our yards have not nearly as much pig iron and scrap as we generally carry, and it's not much of a job to see the day coming when we will have to curtail or quit entirely for a time." That was the opinion of a prominent stove manufacturer who was discussing the situation with this paper a few days ago. He had been interviewing a number of salesmen who were in touch with supplies, but he could get nothing definite that would help him.

"As a matter of fact the men who have charge of the distribution of pig iron in this district seem to have a lead on the government. They are already in control of the situation, and believe me the only chance you have to get a ton of pig iron is to have a contract that has a very direct bearing on the carrying on of the war. I was certain that the last time I went to the furnaces in Hamilton that I had put up a pretty good case for the stove maker, but I was simply asked if we could make a stove that could be shot at the German army in the place of shells. If so we could get pig iron. If not, we could not get any. We make a good many stoves, of different sizes and kinds, but we haven't anything that can be shot at the German army."

Questions That Are Asked

As a matter of fact the pig iron in this section of the country has been under control for some time, and in a very direct way, too. A questionnaire has been used, it being required that it shall be filled out in duplicate, one part going to the director of licenses of the War Trade Board at Ottawa, and the other to the company supplying the pig iron. The questions are as follows:

Please State

1.—The total tonnage of pig iron required based on your estimated monthly consumption from the first day of current month to December 31, 1918.

2.—What class of work this pig iron is to be used for and give the percentage of each class.

3.—What quantity of pig iron you now have in stock.

4.—What quantity of pig iron you have purchased.

5.—What quantity of cast iron scrap you now have in stock.

6.—What quantity of cast iron scrap you have purchased.

7.—The weight in pounds of your daily melt, not including scrap.

8.—The weight in pounds of your daily melt, including scrap.

9.—Approximately the number of melts each month.

10.—What castings you are producing each day directly connected with the government war programme and give weight.

11.—The percentage in weight of your melt now being used in producing castings directly connected with and necessary to the conduct of the war.

12.—If castings are being furnished by you applying on government orders direct, please furnish the order numbers; and if such castings apply on indirect government orders, give name and address of your principal.

The accuracy of the above report is certified to as being substantially correct to the best of my knowledge and belief.

Firm............ ....
Address ... ...
Date............. Signed..........

RUSSIA SHOULD BE BIG MARKET FOR MACHINERY TRADE AFTER WAR

AS the great war draws nearer and nearer to its closing stage, the problem of finding suitable markets for the future output of British industries, when they are demobilised and placed once more on a peace footing, becomes more and more urgent. Despite the present pre-occupation of the industrial world with war requirements, and the chaotic state of Russia, which makes it well nigh impossible for any individual manufacturer to take immediate steps towards securing for himself a share in the future Russian imports, it is not inopportune to draw attention of the wider circles of British machinery manufacturers to the possibilities of the Russian machinery market, which offers a ready field for the future output of the demobilised British engineering industry.

Developments in the Russian Machinery World

The last few years before the war witnessed in Russia great developments in the use of machinery, both in agriculture and industries. More than half of the machinery used in Russia was imported from abroad (53%). The imports of machinery, which during 1906-1910 averaged £7.500.000 per annum, reached in 1913, £16 300,000, while during the first six months of 1914—the last normal pre-war period—they exceeded £10,000,000. Simultaneously with the growth of importation of foreign-made machinery. Russian production also developed, and it is computed that home production of machinery in Russia reached in 1914 £20,000,000. Adding to this figure the amount of imported machinery, we arrive at the total of £40,000,000, representing the volume of machinery absorbed by the Russian market in the more or less normal year 1914.

Importance of Agricultural Machinery

In Russia's machinery importation and home production, in normal times, agricultural machinery constituted an important part, amounting altogether to £7,000.000 per annum, of which £3.000,000 worth was imported from abroad, and £4,000,000 worth produced at home. Although the whole prosperity of the staple industry of Russia—agriculture—depended on the uninterrupted importation of agricultural machinery, this department suffered most from the dislocation of the import trade, necessarily modified by the war requirements, as will be seen from the following table:

IMPORTS OF MACHINERY INTO RUSSIA THROUGH EUROPEAN FRONTIER

	1914	1915	1916
Total	£12,020,000	£4,540,000	£1,242,000
In which were included:			
Lathes	1,170,000	1,510,000	4,610,000
Gas and Oil Engines . .	690,000	370,000	1,370,000
Dynamos . .	680,000	270,000	1,060,000
Various Machinery ..	2,720,000	780,000	1,120,000
Agricultural Machinery	2,870,000	70,000	450,000

Even if we add to these figures the imports of agricultural machinery through Valdivostock, which amounted to £140,000 in 1915 and £420,000 in 1916, the situation remains equally unsatisfactory.

The Revolution and After

The revolution of 1917, followed by a year of civil war, industrial disturbances and economic paralysis generally, has not improved the situation. It was a year of economic destructiveness. While the importation of foreign-made machinery completely stopped, the home production reached the lowest possible level. Exactly how low it is impossible to say on account of the absence of any reliable statistics. Suffice it to say that the need for machinery, especially agricultural machinery, in Russia has never been so acute as it is at the present moment. It is felt particularly acutely by the peasant and working class population now that the first flush of revolutionary excitement has passed away, and the stern economic necessity dictates an immediate resumption of productive work. Before Russia can re-establish her normal functions she will require a large amount of imported machinery, and it will depend on the foresight and energy of British industrialists whether this vast market is exploited by the demobilised industry of Germany or by that of this country.—From "Russia."

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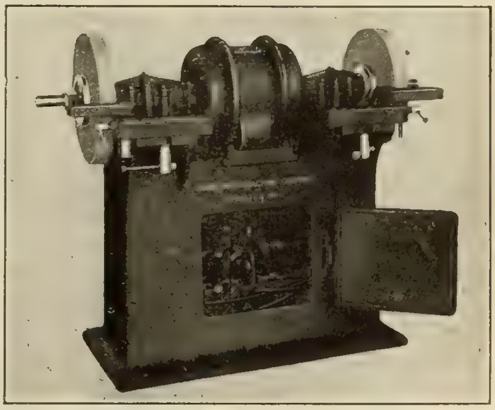

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NON-WAR INDUSTRIES CAN'T GET SUPPLIES

Pig Iron Being Cut Off and Saved for Group of War Industries

TORONTO.—From time to time the statement has appeared that there was a tightening up in the supply of basic materials to the various institutions in the Dominion. Although a great deal does not appear on the surface, evidence is occasionally found which goes to show that the supply of such materials as pig iron is being dealt out to the war group in quantities in keeping with their needs. In fact it is seldom that a complaint is heard from any of these firms that they are being held up for want of material. There is a fairly good system worked out by which the War Board keeps the situation pretty well in hand.

Other firms are not faring so well. The representative of CANADIAN MACHINERY has met several outside foundrymen this week who were in the city in search of pig or good scrap. They are not being well served, and in some cases the supply has diminished to such a point that a temporary shut-down is in sight unless something comes along to relieve the situation, and that something is very uncertain at the moment.

Just to-day one firm in Toronto, manufacturing hardware supplies, soil pipes, fittings, stove boilers, etc., was turned down in its request for pig iron. This firm has enough material on hand to run along about six weeks, and unless it can go over to war work, the prospects are for a shut-down for a time at least.

Steel Prices Hold

No changes are made in any of the quotations in the steel market to-day, and indications point to a continuance of values that have been named for some days. From information received at this office it would seem that there is a fairly large amount of structural building waiting until there can be a supply of material for that purpose. Inquiries have been made at several of the firms dealing in structural steel, and the information is invariably given that it is useless to put in the order at Ottawa, for the simple reason that the War Board will not entertain it.

Conditions in United States are reflected here to a large extent. In a recent survey made of the pig iron situation there, some 300,000 tons of pig iron were found in the hands of industries that the War Board there refused to recognize as "essential." Recognition being denied them, this amount of material was confiscated and placed with firms that were working on strictly war contracts. No such action has been taken here, because supplies are hardly allowed out in proportions large enough to permit of such a situation.

Scrap Metals

There is very little trade moving in the scrap metal market this week. Dealers are keen to secure anything in the nature of good foundry scrap for the demand for it is very marked. As a matter of fact, though, users of materials that usually go into scrap in the course of time are holding to them now, as the cost of replacement is a feature that they have to consider. Railroads in Canada are following the same policy as those in the States, and they are making their stock work overtime to cope with the transportation problems that they are facing.

Although prices for copper scrap, turnings and wire advanced quite sharply in sympathy with the new fixed price in United States, dealers do not report any larger amounts coming into the market.

Occasionally the question of reclaiming tin comes up. No doubt the $1.25 per pound price at which tin is moving has something to do with the agitation to reclaim certain portions of it. There is nothing of a practicable nature in the proposal as far as this country is concerned. It would take between seven and eight thousand tin cans to weigh a ton, and the value of the cans would be about $12 at the factory, according to present prices.

In Narrower Margins

Dealing in copper is coming gradually into a smaller compass. Dealers are not able to go into the market and buy all they want. There are limits now, and they are very closely defined, with the consequence that the available supply of copper is becoming scarce.

Prices for certain kinds of copper, for special uses, are advancing very much in excess of the price for the commodity fixed by the authorities. For instance, copper in the form used by photo-engravers is a hard thing to obtain and prices on that line have been advanced quite sharply, the result being higher prices for printing illustrations, etc.

Dealers here report only one minor change in market quotations, lead having moved up a half cent per pound.

Machinery and Supplies

Machinery for munitions plants comprises the principal class of business moving now. In this connection it is interesting to note that the Leaside Munitions Co. are proceeding with the construction of a new plant for machining 12-inch shells. Orders for a considerable amount of the machinery have been placed and also the contract for the transmission equipment. Local dealers report business as being fairly good but with a quieter tendency. Express shipments continue slow and are not much quicker than freight shipments.

An advance has been made in electric weld-proof coil chain. New prices now named range as follows: 3/16 x 5, $18.25; ¼-inch, $15.65; 5/16-inch, $13.15; ⅜-inch and larger, $11.90. A corresponding increase in other sizes and qualities has also been put into effect. Practically the entire line of the Stanley Rule and Level Co.'s goods has advanced. Prices generally on machine shop supplies are holding firm, with a shortage in some lines.

NO RAISE LIKELY IN PRICE OF SCRAP

THERE seems to be a general feeling in many points in U. S. that there is no chance of an increase in price on scrap material. Dealers in scrap metals were hoping that there might be an advance recognised by the Government, but all chances of this seem to be off for the present at least. U. S. points report as follows:

Pittsburgh.—Some of the consumers around here seem to be fairly well off in the matter of supplies, but as a general thing they are getting ahead at this time of the year for winter use. Things are much different this year though, and very few of the users are able to stock up against the months when transportation will be bad.

New York.—Prices remain firm here, with demand good. The trade as a general thing shows little anxiety over the outcome of the price fixing conference at Washington, as they seem to take it for granted that there will be no change in the prices for scrap material.

Buffalo.—The dealers here are not able by any means to get ahead with their business. Most of them have old contracts on hand that they have not been able to discharge yet, and adding to the general trouble there is considerable difficulty experienced in holding the labor in the scrap yards.

Cleveland.—The increase that has been granted in pig iron will not in any way make changes in the scrap situation. As a matter of fact all the scrap that is available is being bought out around here. A few of the big consumers have fair sized stocks on hand, but most of them are in poor shape to face the coming winter and keep up their trade.

Chicago.—A great deal of the business that has been done here at the present time passes directly between the place where the scrap metal originates and the melters, thus eliminating the dealers entirely. In spite of this, though, the dealers have so much business on hand that they cannot get material to fill their orders.

Cincinnati.—Stocks that the scrap merchants have on hand are being drawn on so rapidly that it is now a certainty that receipts from the outside sources will not be able to put them in good shape for the winter months. There are also frequent delays in the sorting and loading, due to the unsatisfactory labor market.

St. Louis.—The railroads are practically offering no scrap at all at the present time. As a matter of fact the tonnages that are in sight at the present time are ridiculously small when compared with the demand.

Philadelphia.—Some idea of the shortage of the scrap material can be gathered from the fact that one of the large mills here which, as a general thing, maintains heavy melting steel stock that will run it well on from 20 to 30 days, has now not sufficient in its yards to last over three days.

Becoming a Bigger Man

WHAT is the difference between some men you know and others known to you? Why are some men earning $3,000 a year and some $30,000? You can't put it down to heredity or better early opportunities, or even better education. What, then, is the explanation of the stagnation of some men and the elevation and progress of others?

We are reminded of a story. A railroad man, born in Canada, was revisiting his home town on the St. Lawrence River. He wandered up to a group of old-timers who sat in the sun basking in blissful idleness. "Charlie," said one of the old men, "they tell me you are getting $20,000 a year," "Something like that," said Charlie. "Well, all I've got to say, Charlie, is that you're not worth it."

A salary of $20,000 a year to these do-nothing men was incredible. Not one of the group had ever made as much as $2,000 a year, and each man in the company felt that he was a mighty good man.

Charlie had left the old home town when he was a lad. He had got into the mill of bigger things. He developed to be a good man, a better man, the best man for certain work. His specialized education, joined to his own energy and labor sent him up, up, up. To put it in another way: Charlie had always more to sell, and the world wanted his merchandise—brain, skill and ability. Having more to sell all the time, he got more pay all the time.

Charlie could have stayed in the old home town; could have stagnated like others; could have been content with common wages. In short, Charlie could have stayed with the common crowd at the foot of the ladder. But Charlie improved himself and pushed himself, and this type of man the Goddess of Fortune likes to take by the hand and lead onward and upward. Almost any man can climb higher if he really wants to try. None but himself will hold him back. As a matter of fact, the world applauds and helps those who try to climb the ladder that reaches towards the stars.

The bank manager in an obscure branch in a village can get out of that bank surely and swiftly, if he makes it clear to his superiors that he is ready for larger service and a larger sphere. The humble retailer can burst the walls of his small store, just as Timothy Eaton did, if he gets the right idea and follows it. It is not a matter of brain or education so much as of purpose joined to energy and labor. The salesman or manager or bookkeeper or secretary can lift himself to a higher plane of service and rewards if he prepares himself diligently for larger work and pay. The small manufacturer, the company director, the broker—all can become enlarged in the nature of their enterprise and in the amount of their income—by resolutely setting themselves about the task of growing to be bigger-minded men.

Specialized information is the great idea. This is what the world pays handsomely for. And to acquire specialized information is really a simple matter, calling for the purposeful and faithful use of time. This chiefly.

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IF business—BUSINESS—is your chosen field of work, we counsel you to read each week THE FINANCIAL POST. It will stimulate you mentally. It will challenge you to further studious effort. It will give you glimpses into the world of endeavor occupied by the captains of industry and finance. With the guidance of the POST, and with its wealth of specialized information, you, a purposeful man, aiming to go higher in life and pay, will find yourself becoming enlarged in knowledge and ambition, and will be acquiring the bases and facts of knowledge which become the rungs of the ladder you climb by.

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The Story of War Under the Earth

THE German sappers had discovered and broken into a Canadian tunnel. They had planted a machine gun at their end and sent a shower of bullets down the dark, narrow passage whenever the Canadians made any effort to enter their underground galleries. The story of how two Canadians nailed steel snipers' shields to the front of a push cart and shoved it ahead of them up to the very teeth of the gun, and how they dropped a can of deadly explosive, hopped on to the cart, and let it coast back down the tunnel, while bullets rattled on the shield like hail and, finally, how the explosive blew up the machine gun and its crew and blocked the passage again—this remarkable story is told by Lieut. C. W. Tilbrook (who was one of the two) in the course of an article, "An Underground Tank," in October MACLEAN'S.

Recently a Toronto newspaper declared editorially that the public was tiring of war books and war stories because of the sameness of them. The newspaper was right. But the public literally devours any story of the war that is new. The series of articles that Lieut. Tilbrook has done for MACLEAN'S have been read with an astonishing amount of interest *because they are different from anything that the public has yet read.*

Warfare in the tunnels is a terrible business—grim, silent, cruel. It is a strangely technical phase of warfare and the "sappers" go about their business with queer instruments that might have figured in a Jules Verne phantasy. To read of underground fighting, as Lieut. Tilbrook tells of it, is to get a vision of a new kind of war altogether—something gripping, fearsome and mystifying.

"An Underground Tank," is the best of his series. But, after all, it is only one feature in a long array that makes the October issue of MACLEAN'S one of unparalleled interest.

A STRANGE CHANGE IN WOMAN'S WORLD. By Agnes C. Laut.

The new status of women, arising out of the war, is treated in the powerful style of this famous writer, who came from the Canadian West. It introduces a new thought.

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Monarch Engineering & Mfg. Co., Baltimore, Md.
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
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Whitehead Bros. Co., Buffalo, N.Y.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
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Hamilton Facing Mill Co., Hamilton, Ont.
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Monarch Engineering & Mfg. Co., Baltimore, Md.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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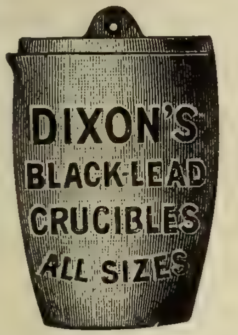

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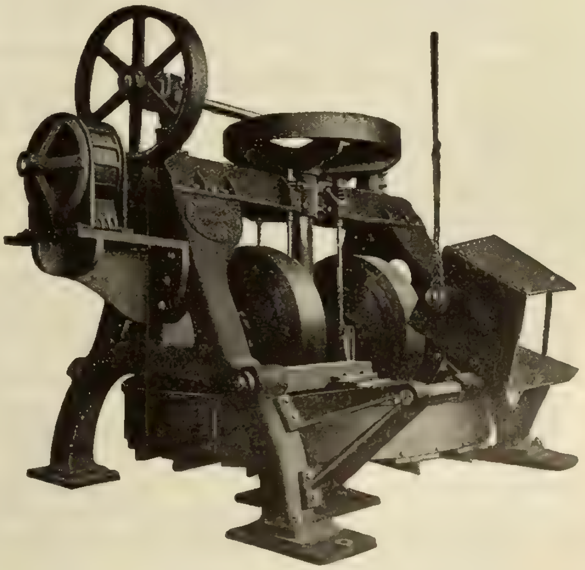

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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.

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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Woodison, E. J., Co., Toronto, Ont.

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Joseph Dixon Crucible Co., Jersey City, Pa.
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SPRUE CUTTERS

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Can. Hanson & Van Winkle Co., Toronto, Ont
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia
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SQUEEZERS, POWER AND HAND

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Tabor Mfg. Co., Philadelphia,
Woodison, E. J., Co., Toronto, Ont.

STEEL, CRUSHED

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL GRIT

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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison. E. J., Co., Toronto, Ont.

STEEL RAILS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

STEEL BARS, ALL KINDS

Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hart Wheels, Hamilton, Ont.

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Northern Crane Works, Walkerville.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
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Hyde & Sons, Montreal, Que.
Sterling Wheelbarrow Co., Milwaukee, Wis.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

WIRE WHEELS

Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
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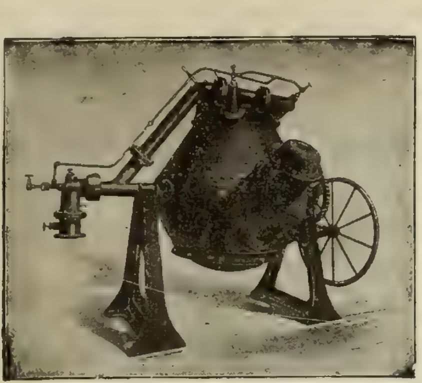

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The Only Perfect Melter

All metal from 50 lbs. to 10,000 lbs.

Is Absolutely Uniform

Write for catalog and complete information

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Copper
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Do you want help or have you something to sell, if so use the classified column in this paper.

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Ensures 100%

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SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

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ANGULAR GRIT---THE SCIENTIFIC METALLIC BLASTING ABRASIVE

that reduces sand blast costs and conserves labor. ONE TON of ANGULAR GRIT will do as much work as carloads of sand; its sharp cutting points makes it superior to all other abrasives. Write for samples.

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CRUCIBLES

are made to save money by Service not by single purchase.

Forty years leadership---Quality and Worth maintain it.

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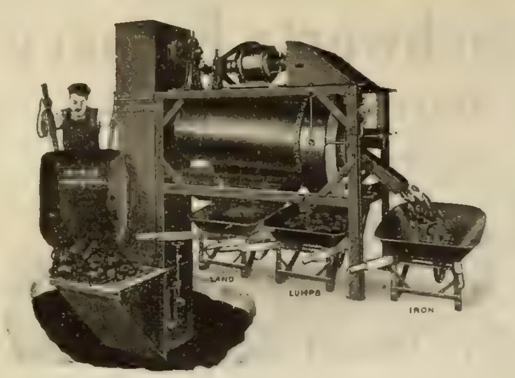

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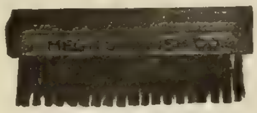
Will save that waste iron and screen your sand as well.

Our Type "F"

Separators require no shoveling. Simply dump the material into the grizzly.
Note elevator feature. Magnetic separator can be furnished without this feature if desired, thus reducing cost.
One of Canada's largest foundries has just ordered one. Name supplied on request.

They Save Labor and Metal

MAGNETIC MANUFACTURING CO.
Windlake and Fourth Ave. MILWAUKEE, WIS.



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Bent Handle Washout.

Shoe Handle Washout.

Floor Brush.

A-1 Foundry Brushes

Get your next supply from us. We can meet every foundry brush requirement on the shortest notice. You'll find our prices right.

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Fire Brick and Cupola Block Headquarters

Fire Brick are not to be bought as you would buy Eggs or Oats.

To economically and successfully use them they must first be bought with knowledge of their QUALITIES as well as with knowledge of their REQUIREMENTS when in actual service.

Every brand of Fire Brick is thus made for a SPECIFIC PURPOSE.

One brand, for boiler settings, for hand-fired horizontal boilers, which resists 2,000 degrees Fahrenheit and which must resist also the abrasion wear of the slicing-bar of the fireman when he knocks off clinkers. When the wrong kind is used not only the clinker but the brick too are destroyed—there is needless expense.

Another kind, for heat-treating furnace lining where high degrees of heat prevail.

Still another kind for cupola linings, which must resist not only heat but abrasion wear of the charge as it wears down through the melting process.

So it goes; each for its purpose. This is not an intelligence office but intelligence is used in supplying the right Fire Brick for the right purpose.

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I carry these brands IN STOCK. Note the advantages: Every Brick reaches the user with clean, straight edges, uninjured, and every one is thus adaptable to a straight line of masonry in the brick wall. Again, many Fire Brick manufacturers are several months behind orders. I can accept your order IMMEDIATELY and deliver with reasonable promptness.

There is no duty on ordinary Fire Brick. I can ship Fire Brick, Cupola Blocks and Fire Clay in carlots or less. Write stating the service required.

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Manufacturer of Foundry and Electro-Plating Supplies and Equipment.

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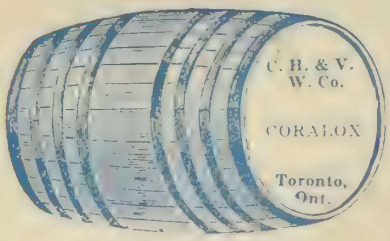
Coralox Emery



Coralox is the highest grade abrasive known.

Coralox is made from pure Corundum electrically heat treated.

Coralox is not alone harder than any natural abrasive, but of a distinctive "temper" rendering it peculiarly adaptable to polishing all metals.

We carry large stock of Coralox in warehouse, Toronto, and are prepared to make prompt deliveries from this point.

If you are not already using Coralox, write us for sample to-day.

CANADIAN HANSON & VAN WINKLE CO., LTD.

TORONTO, CANADA

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. IX. PUBLICATION OFFICE, TORONTO, NOVEMBER, 1918 No. 11

FLINT

MOLDING and CORE SAND

99:89% PURE

SILICA

A WASHED, RE-WASHED STEAM-DRIED, SCREENED PRODUCT OF ST. PETERS ROCK

The only sand that fully meets all the requirements of

SEMI-STEEL SHELLS

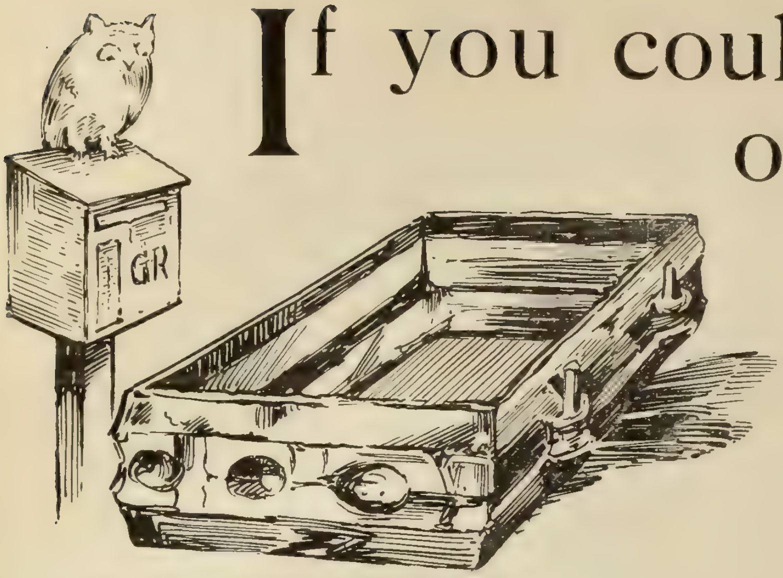
as outlined by authoritative speakers at the Allied Metal Trades Congress at Milwaukee.

It is pure silica, uniformly coarse, free from dust, non-fluxing, free-venting, with high heat resistance.

UNITED STATES SILICA COMPANY

1939 PEOPLES GAS BLDG. CHICAGO, U.S.A.

If you could get on the outside of your foundry and look in—



If you could see the waste—the labor waste—the material waste;

If you could put your finger on the CAUSE—

You would still need—and mightily want—

KAWIN SERVICE

And whether you can do these things or not, if your profits as a foundry owner have diminished, make up your mind to one thing: Your foundry is sick.

And if your net earnings are not far greater than in August, 1914, you can be sure that something is wrong.

In either case neither labor shortage nor material shortage is responsible. War conditions have simply aggravated **that which is wrong.**

It may be your cupola practice.

It may be your method of buying raw materials.

It may be the use of costly materials where less expensive, properly handled, would do.

Whatever it is—one thing or many—**Kawin Service** will ferret out that which is wrong.

And make it right.

Kawin Service includes chemists, metallurgists, practical foundrymen. **Kawin Service** comes to you guaranteed to save you 100% over and above its cost. If that seems fair—

Write to-day for full particulars.

Charles C. Kawin Company. Limited

CHEMISTS, FOUNDRY ENGINEERS, METALLURGISTS

307 KENT BUILDING, TORONTO DUN BUILDING, BUFFALO, N.Y.

Dayton, Ohio Chicago, Ill. San Francisco, Cal.

LET US SELL YOU A

DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it —you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES
don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

THE E. J. WOODISON COMPANY, TORONTO

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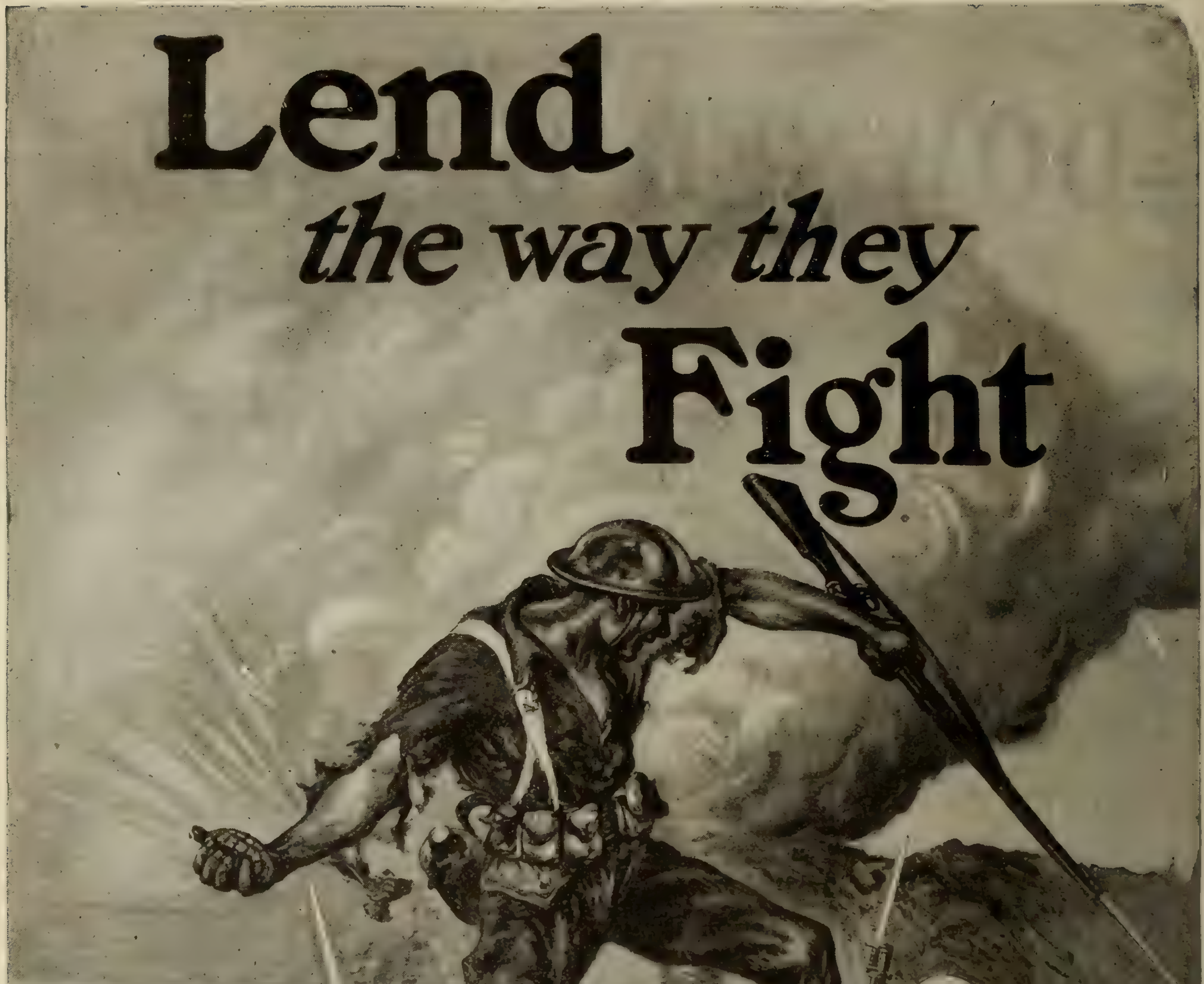

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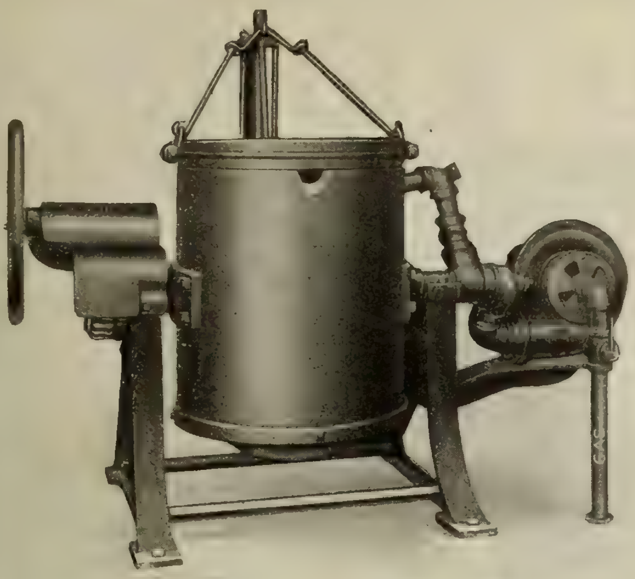
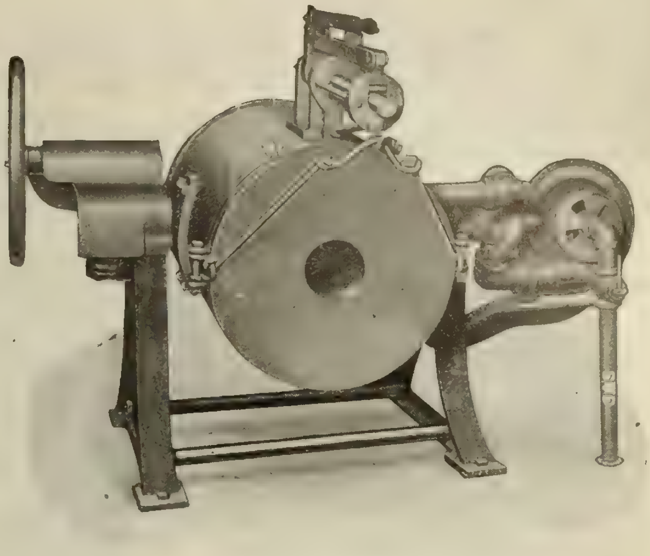


Front view of furnace equipped with Premix Motor Blower for Gas Fuel.



Front view, furnace tilted for pouring. The worm gear tilting mechanism holds furnace safely at any angle.

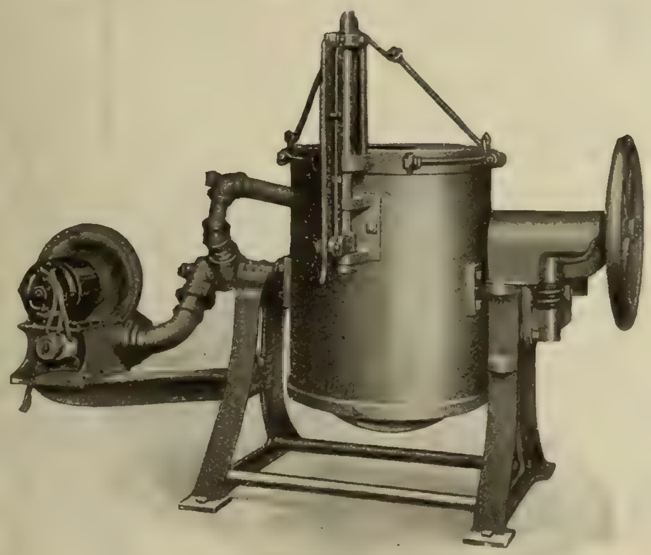
New Monarch Vertical Melting Furnaces

WHERE a small, quick melt in a non-crucible furnace is desired the **New Monarch Vertical Non-Crucible Tilting Furnace** is the furnace you need. Melts Brass, Copper, Monel-Metal, Nickel, Aluminum, Bronze, Gold, Silver and any ordinary foundry mixture. Equipped with Premix Motor Blower for oil or gas fuel.

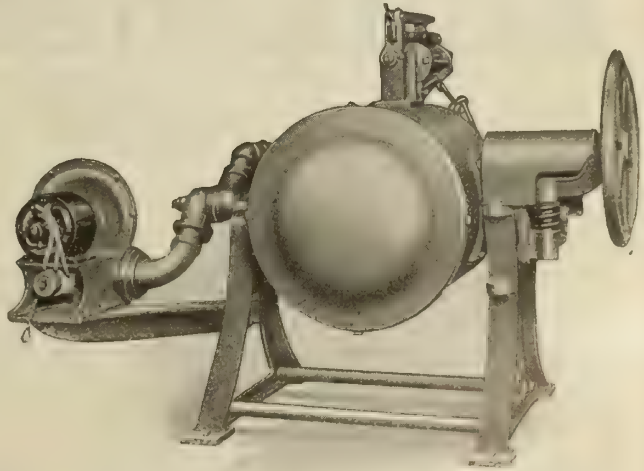
The new **Monarch** line represents an advanced principle in Melting Furnace construction. They are reliable and economical, and many Canadian and American foundrymen stand ready to testify to their superior merits. If you want to cut the costs and secure better melts, adopt the new **Monarch.** Better write for circular giving the full details.

The Monarch Engineering & Mfg. Company

Shops: Curtis Bay, Md. **1206 American Bldg., Baltimore, Md., U.S.A.**



Rear view showing Premix Motor Blower and cover-lifting and swinging device. The gas or oil burns and melting proceeds continuously whether furnace is upright or tilted.



Rear view, furnace tilted for pouring, showing round bottom. Inside bottom corners are rounded, which eliminates loss from metal adhering to lining in corners and preventing the pouring of full contents. Adopted readily to any existing "air or oil and gas" line.

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

SLY Foundry Equipment

To help your men have a bigger showing at the end of each day's work, give them **Sly Foundry Equipment.**

This is one way you can keep your output above normal in spite of labor shortage.

For example, the Sly Sand Blast illustrated will clean more castings daily than any other you can procure. It has great strength where others are strong, and it is strong where others are weak. There is practically no wear out to the nozzle.

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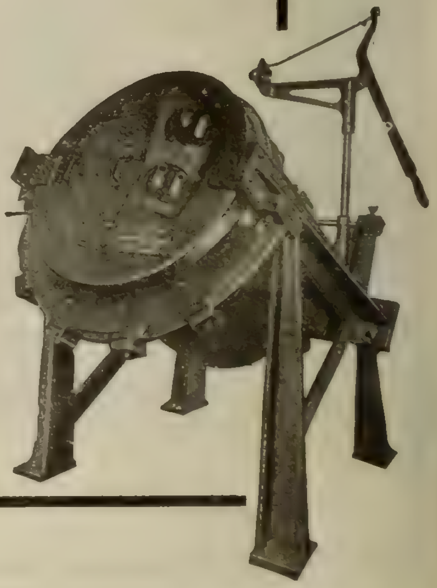
- Cinder Mills
- Resin Mills
- Dust Arresters
- Core Sand Reclaimers
- Cupolas

Full list upon request.

THE W. W. SLY MFG. CO.
CLEVELAND, OHIO, U.S.A.



Planning for War —and Peace

In the field of manufacture, as on the field of battle, American strategy has been a big factor in the winning of the war.

Our fighting men at the front, and our fighting men back of the front, down to the humblest of the workers in shop and shipyard, have given heroic demonstrations of their courage, initiative, resourcefulness and spirit of self-sacrifice.

Our war plans have made good. But what about our Peace plans?

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We believe it is a promise—but only to those who continue to seek diligently *now* for better methods of management and production.

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By striving steadily to increase our production of Keller-Made Master-Built Pneumatic Tools, and to improve the tools themselves so that they can be depended upon to increase the production of the Shipyards, Shops and Foundries using them, we have not only "done our bit" to render certain the outcome of the great Battle for Democracy, but have at the same time and to the same extent helped to pave the way for the winning of the great Battle for World Trade that is to follow.

Preventable inefficiency is Treason during the war. After the war it will be Business Suicide.

KELLER-MADE
PNEUMATIC
TOOLS
MASTER-BUILT

William H. Keller *President*

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During these days of unusual trouble, the one big idea is to conserve.

Among Foundries, the most keen conservers are using

Stephens' "East India" Plumbago

because these Plumbagos have proved superior to all others.

King Kore Kompound and Stephens' Carbon Blacking

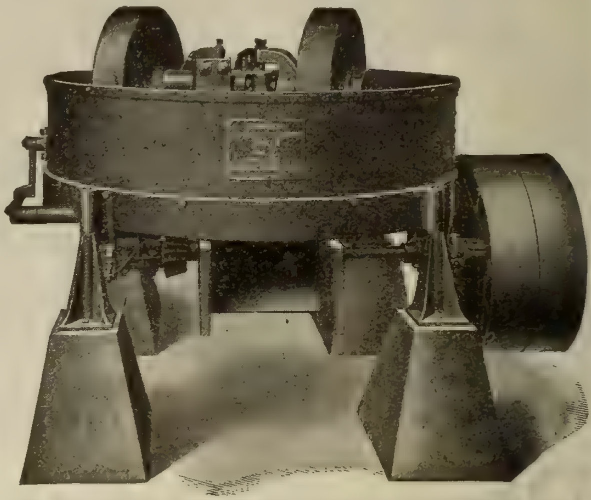
are also on the conservers' list.

We also carry a complete stock of Foundry Supplies, also Platers' and Polishers' Supplies at our Montreal warehouse.

Standard Machinery and Supplies, Limited
MONTREAL
QUE.

A Message to Canadian Foundries
THE SIMPSON
INTENSIVE FOUNDRY MIXER
Saves Both Sand and Labor

Improves the quality of the castings.
Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.

Write for details and prices to

National Engineering Co.
Room 505, Tacoma Bldg.
CHICAGO, ILL.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the best possible wheel for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

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LIMITED
Manufacturers of Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

Semi-Steel Shells and Other High Grade Castings Made of McLain's Semi-Steel Were the Centre of Attraction at the Foundrymen's Convention

McLAIN'S SEMI-STEEL IS THE KEY TO FOUNDRY PROFITS TODAY

Since 1903

we have been advising Semi-Steel for castings that require high tensile or must stand air-hydraulic or other severe tests and foundrymen have finally woke up to the fact that Semi-Steel cannot be made by merely throwing some steel scrap in the cupola. As a result we have sold more copies of McLain's System the *past three months than in any previous twelve months.*

If you're making anything else and *calling it Semi-Steel* you stand to lose the customer you are sending it to when he once gets hold of a McLain Semi-Steel casting—the real Semi-Steel. This has happened many times—so act now. Get in touch with us before it happens to YOU.

Most firms consider it good business to buy anything that will pay for itself in 3 to 4 *years,* but McLain's System has paid for itself in many cases in *three* to *four* weeks.

More than 2900 foundrymen have bought McLain's System

Why?—It's worth the money. You not only know then that your practice is right, but if it isn't—HOW TO MAKE IT RIGHT, it's easy for some one to come into your shop and tell you something new to do—anyone can make changes, but we

Guarantee Our Instructions Mean Savings

on coke—mixtures—better castings, with less melting and casting losses, etc. Get wise to this fact and

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700 Goldsmith Bldg.
MILWAUKEE, WISCONSIN

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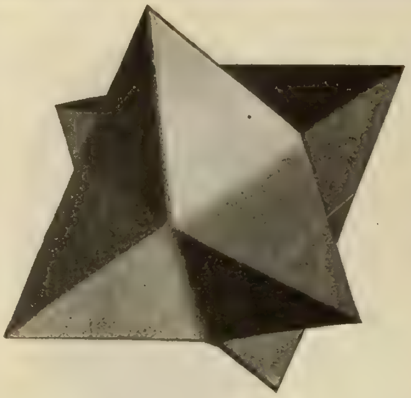

Tumbling Stars

DURABLE AND EFFECTIVE CLEANERS

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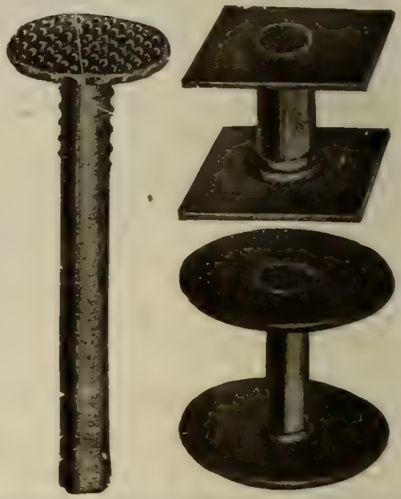

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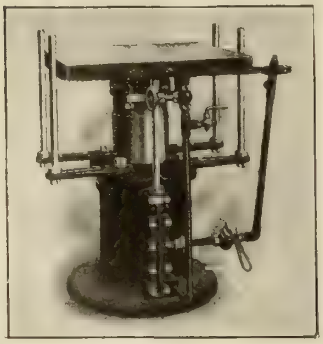

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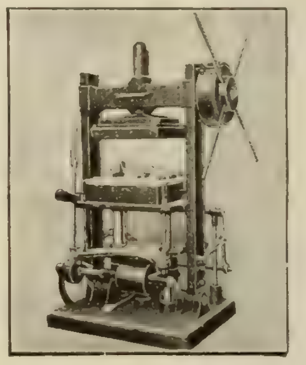

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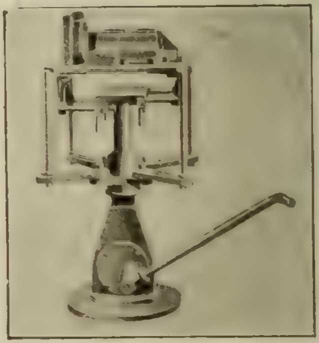

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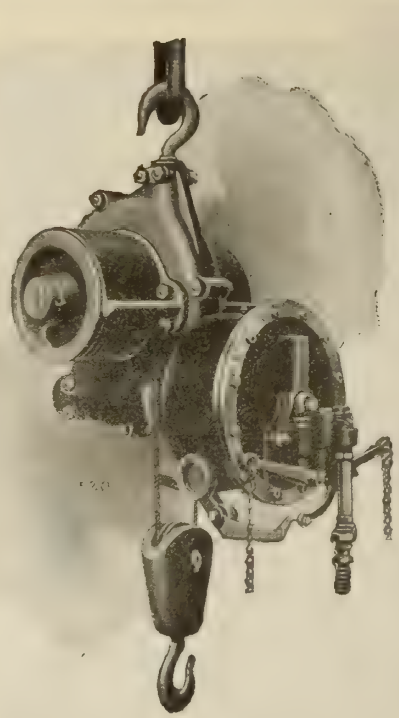

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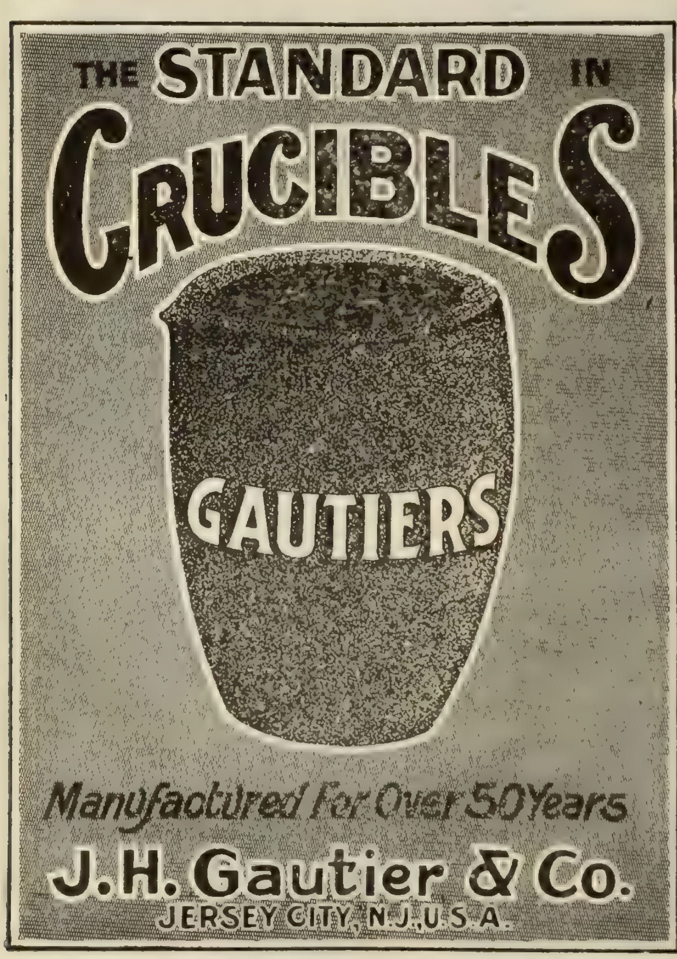

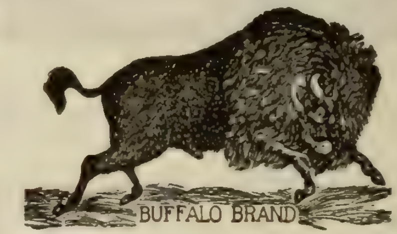

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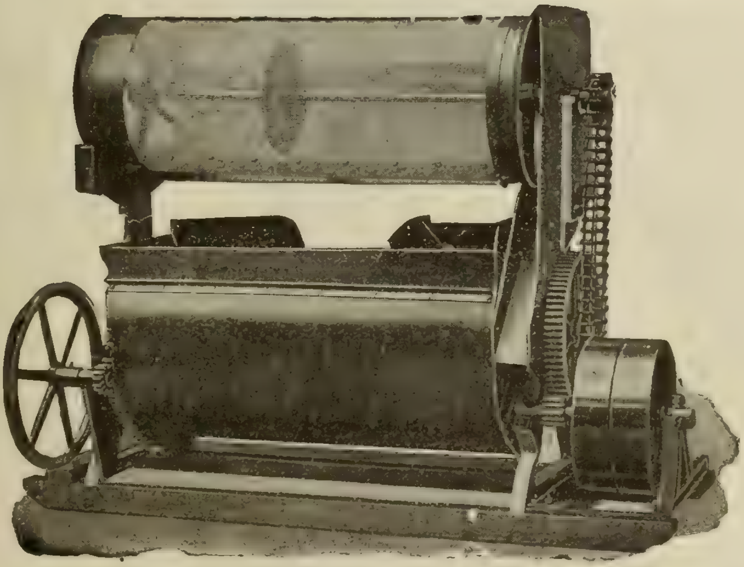

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CANADIAN FOUNDRYMAN
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METAL INDUSTRY NEWS

How Marine Cylinders Are Moulded and Cast

The Imperial Munition Board Programme Includes Some of the Largest Marine Engines Ever Built in Canada

By F. H. BELL, Associate Editor

THE molding and founding of cylinders is a subject which never grows old. The art of molding and the science of founding are no where better exemplified than in the production of this class of casting.

As our heading would imply, the class of cylinders to be dealt with in this article is that called for in the orders from the Imperial Munitions Board, to be used on the engines of the ships being built for Canada's new merchant marine.

When it is remembered that the cylinder constitutes the real power of the engine and is depended on to propel the ship thousands of miles from land, it will be readily understood that it must be without blemish.

It must be composed of clean, sound, close-grained iron which will bore out smooth, and be free from defects of any kind either as regards material or workmanship, and lastly it must undergo the pressure test and be O.K.'d by the Marine Underwriters' inspector. From this it will be easily appreciated that every one who is in any way connected with its construction is directly responsible for the results. The quality of the metal purchased, the purity, of the fuel used in the melting of it, the manner in which it is melted, and the temperature at which it is poured, coupled with the skill of the workmen who perform the work of molding and coremaking, and the untiring efforts of the superintendent and foremen who see that workmen are provided with proper equipment and material, all contribute to the success or failure of the casting.

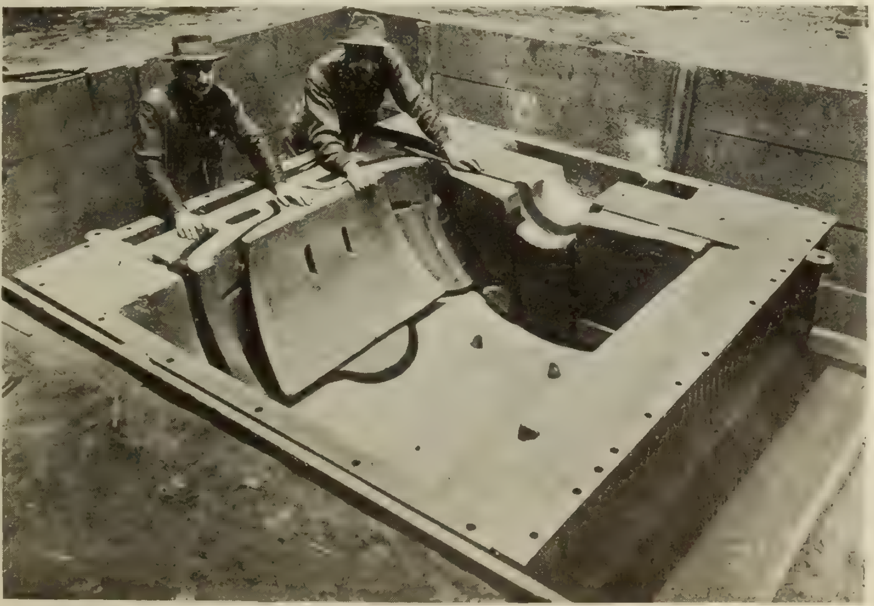


FIG. 1—Drag for 54″ low pressure, slide-valve cylinder. Note clay balls on bottom of barrel to show thickness of metal after trying in core; also chaplets separating steam chest and port cores.

Through the courtesy of the genial Mr. Wingate, general manager of the Gurney Foundry Co., and Mr. McCormick, the general superintendent, we are enabled to give a fairly detailed description of how this intricate class of work is done at their plant in West Toronto.

The method adapted is similar to that commonly employed in molding stationary cylinders. The pattern is parted in the middle and molded and poured lying on its side. Complete iron flasks are used. These flasks are one inch in thickness and well reinforced with ribs. They are all interchangeable and range in size from 9 feet square down to any size required for smaller cylinders.

Trunnions are provided for convenience in rolling over. Permanent pits are provided some 12 ft. square and 5 ft. deep in which to make the mold and pour it. These pits are not used in the ordinary sense of foundry pits, but are simply used to bring the mold down low enough for convenience in molding and pouring, as well as providing backing for braces to support the mold against straining under pressure of metal while being poured. The space between the flask and the walls of the pit, allows ample room for the workmen to walk about while working on the drag, and the walls also provide good foundation for scaffolding while ramming and finishing the outside of the cope. Before proceeding further it is as well to explain that these molds are all made in dry sand. The facing used is composed of 3 parts old molding sand and 1 part new, mixed in the proportion of 12 to 1 with black core compound, to which is added a keg of pine saw-dust for a batch big enough for one mold. No flour is used; the black compound taking its place, but thin clay wash is used with which to temper it. In beginning to make the mold the smooth follow board is placed on the bottom of the pit, and the bottom half of the mold proceeded with as in all green or dry sand work. The pattern and follow board are covered with a few inches of facing sand and well rodded and nailed wherever a rod or a nail can be utilized to any apparent good purpose, after which it is backed up with heap sand, and properly rammed and vented. A staunch iron plate an inch thick constitutes the bottom. This is bedded on and pounded to a perfect bearing with a sledge and securely bolted, after which it is turned over by means of a powerful pneumatic crane, in less time than it takes to tell the tale. The cope is rammed up in a similar manner and lifted off by this same pneumatic crane and rolled over on its back. The patterns are drawn with the crane after which the mold is finished and blackwashed placed in the oven and is thoroughly dried. These molds are not skin-dried but are dried from top to bottom, making a hard, open-grained, yet smooth-faced body for the iron to lie against, equal in every respect to a loam mold. The sawdust opens the pores of the sand similar to a loam mixture, while the compound and the clay wash hold it firm. After being dried and sufficiently cooled to be handled, the drag is returned to the pit, where it is rubbed

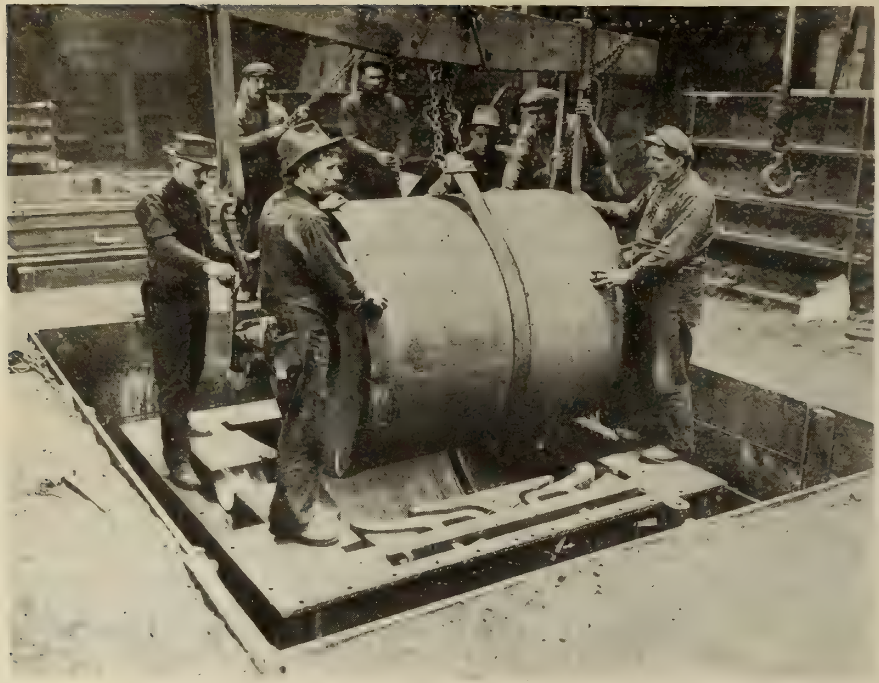


FIG. 2—CORE BEING LOWERED INTO PLACE. SEE COPE TO RIGHT SHOWING MANNER IN WHICH SECTIONS ARE BUILT TOGETHER, ALSO SHOWING SYSTEM OF VENT HOLES.

perfectly smooth by means of waste, soaked in coal oil, and finally finished with dry plumbago. It is now ready to receive the cores which form the interior of the cylinder as well as the various ribs and branches on the outside.

Fig. 1 shows drag for low pressure slide valve cylinder with bottom half of steam-chest and port cores, also bottom half of core which forms the flange for stuffing box, as well as the ribs for strengthening lower head of cylinder and the brackets which support the cylinder on the upright columns. Fig. 2 shows main core being lowered into place in the drag. Fig. 3 shows top half of core being lowered into place, showing how end of cylinder will appear. Figs. 4 and 5 show different views of high pressure cylinder, showing it to have round piston valve.

The making of the cores is of equal importance with the making of the mold. The sand used is pure sharp sand, brought from the shores of Lake Erie and is mixed with linseed oil in the proportion of 1 to 16.

The making of the main core shown in Fig. 2 is of interest. It is made in halves, being swept up on flat plates and dried, after which it is carefully jointed and pasted, appearing as in Fig. 2. The arbor shown in Fig. 7 is placed on the plate and filled tightly with coke, after which the core sand is rammed around it until it is of a sufficient size to be swept to the exact shape and dimentions. The bolt holes marked A.A.A., Fig. 7, are used to bolt the two halves together, and when bolted in three places it makes a core as rigid as though it had been swept on a barrel arbor. The other cores are made in core boxes from the same mixture and are suitably rodded and vented. This is not difficult, as the oil cores are strong in themselves and when burned, very little gas is generated.

The setting and securing of the cores, is undoubtedly the most particular part of the entire job. They must, not only be properly placed but must be secured against being shifted or floated by the force of the incoming metal. The system adopted by Mr. James Douglas, who has charge of this department, assisted by his able aide, Mr. A. E. Scott, leaves no room however for fear. To demonstrate more clearly we will go back to the ramming of

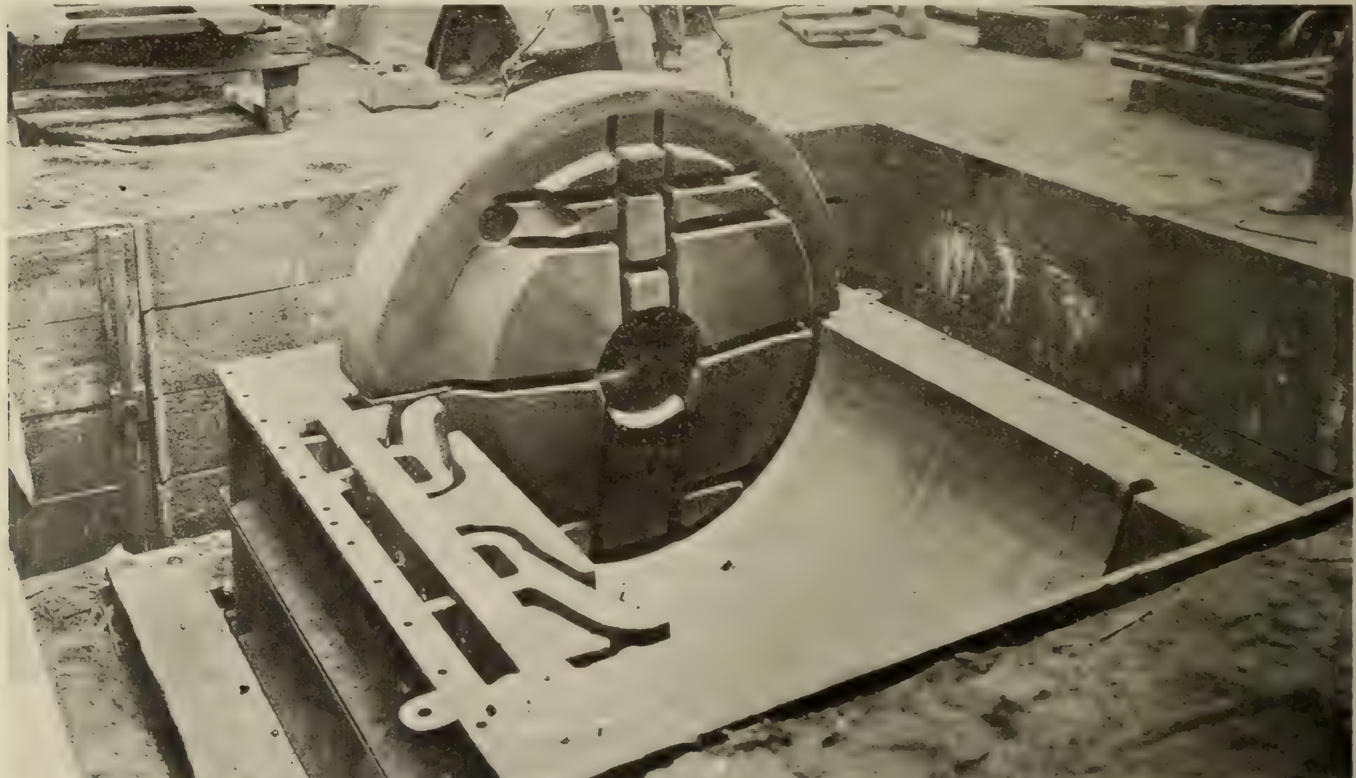


FIG. 3—TOP HALF OF HEAD CORE BEING LOWERED INTO POSITION TEMPORARILY. STUD CHAPLETS IN BARREL IN PLACE OF CLAY BALLS, ALSO SPACE BACK OF CHEST CORE TO FACILITATE TYING CORES INTO PLACE AS WELL AS ALLOWING FOR ESCAPE OF GAS FROM CORES.

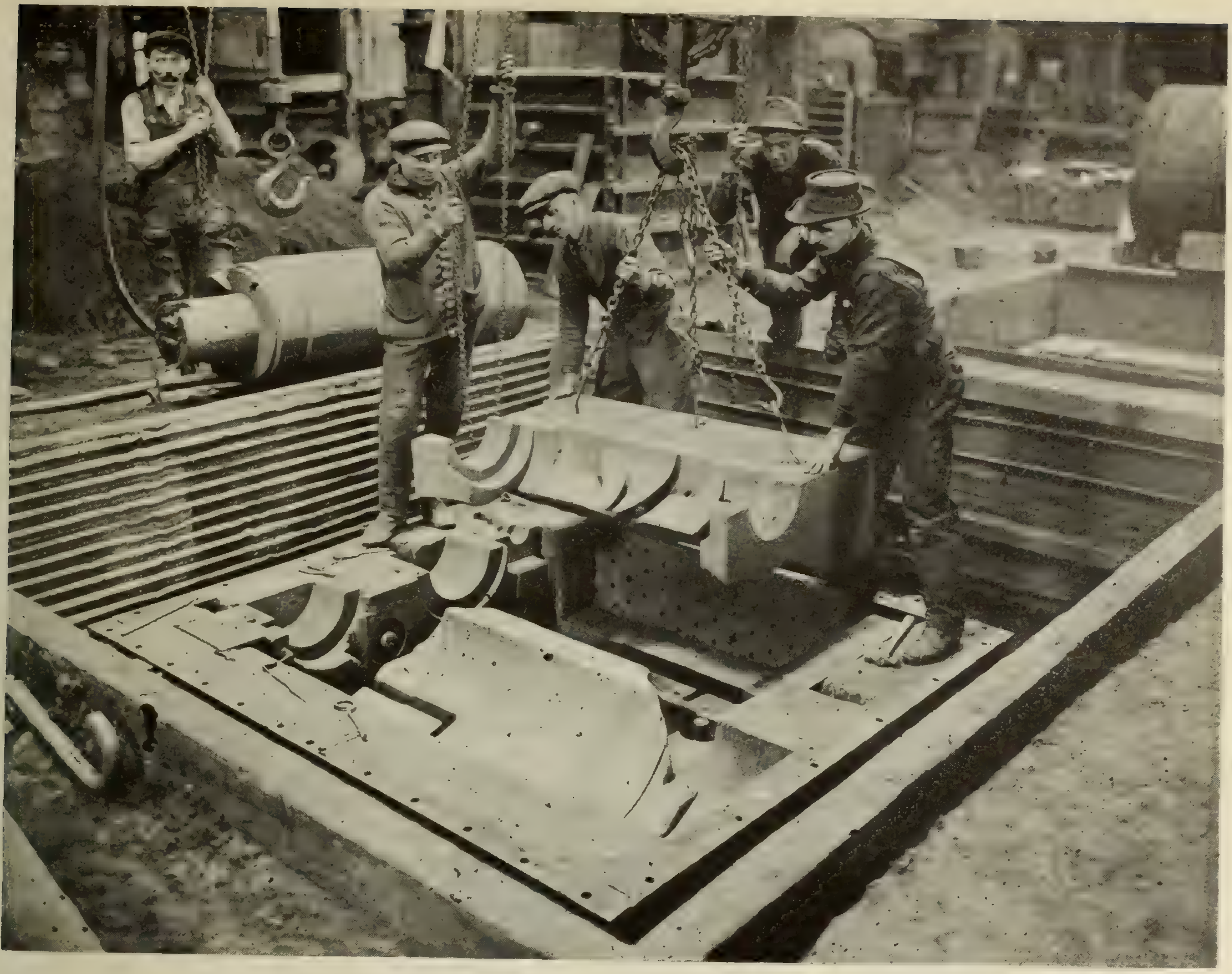


FIG. 5—CORE BEING LOWERED IN PLACE IN DRAG OF HIGH PRESSURE PISTON VALVE CYLINDER.

the drag. It might be explained that the drag has bars similar to the cope to assist in resisting strain. While the half pattern and the drag were on the follow-board preparatory to starting the mold, irons are placed tight against the patterns wherever a chaplet will be required and securely bolted to one of the bars. When the pattern is withdrawn later on, these irons will be seen even with the face of the mold. When setting the cores, balls of clay are placed on these irons, and the core is tried in, temporarily; by so doing the clay balls are pressed into exact thickness required, and a stud chaplet of the size indicated by the clay is placed upon the iron in place of the clay. Stud chaplets are also tightly fitted between cores and side of mold and also between the cores themselves.

In addition the port cores and the steam chest core supporting them are securely tied through the back of the steam chest core-print and onto the outside of the flask. The top half of end core, shown in Fig. 3 is not put into that position until after the main core is placed, when it and the top halves of the steam chest and port cores are put in their proper position and clay balls placed wherever a chaplet will be. The cope which also has irons fastened to the bars to hold the chaplets is now tried on and lifted off and the proper sized chaplets put in place to hold the cores down, and also to keep them the right distance apart. The manner of securing them from the side is different in the cope from what it was in the drag, it not being possible to place studs. Long chaplets are held loosely and drawn towards the outside until the cope is closed

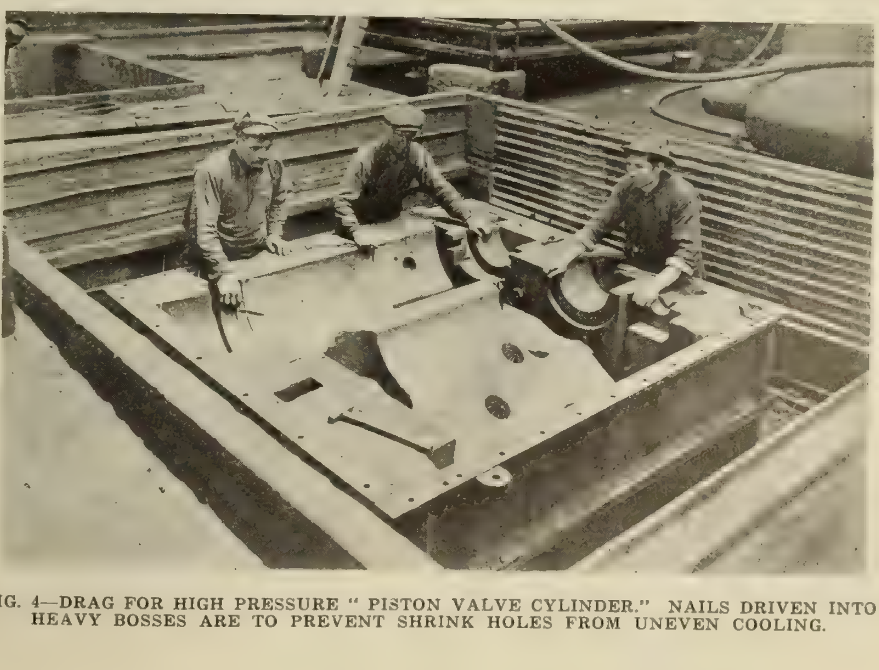


FIG. 4—DRAG FOR HIGH PRESSURE " PISTON VALVE CYLINDER." NAILS DRIVEN INTO HEAVY BOSSES ARE TO PREVENT SHRINK HOLES FROM UNEVEN COOLING.

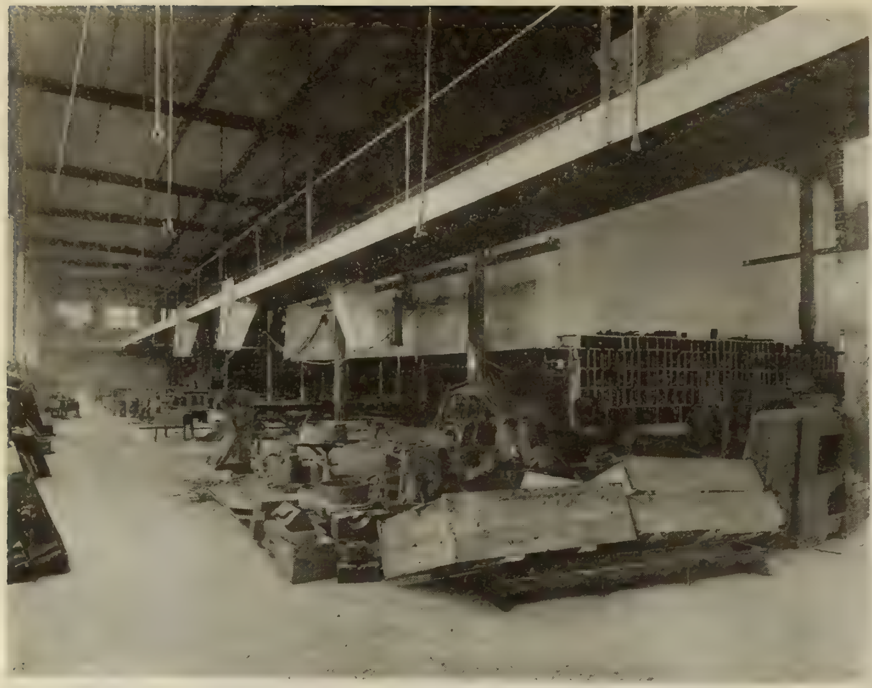


FIG. 6—CORE ROOM AND OVENS, SHOWING OVERHEAD CONVEYORS AND CHUTES FOR DELIVERING CORE SAND FROM SAND MIXER AT THE LEFT.

down for the last time, when they are shoved home against the core and securely wedged as shown. As will be readily understood, when the mold is clamped together, the cores are automatically clamped into place and no strapping down of chaplets is required as is common practice, but as an extra precaution wedges are driven from the outside between the cope and the top of the cores and in addition to this, staunch L shaped irons shown at A., Fig. 8, are securely bolted to the flask, and resting upon the top of the bolt lugs of the main core arbor hold it firm. When the clamping and wedging is completed, vent rods are connected with the vent holes in the different cores on the parting and project out through holes seen on outside of flask. After this the open spaces seen at Figs. 1, 2 and 3 are filled with molding sand, securely rammed in.

The manner of gating is also an interesting feature. Pop gates are used exclusively. These gates are made in cores and are about five-eighths by three inches and of sufficient length to saw off whatever length is required. They are placed on top of the steam chest flange and also on corner flanges on the opposite side. Good judgment must be used in placing them so that the iron will not strike any vital spot. To accomplish this they are arranged so that the iron drops into the bottom flanges. (Out of 150 cylinders made for I.M.B. engines and ranging in weight from 8 tons down to 3 tons not one has shown any sign of cutting from the iron falling this distance). The gates are connected on top by basin running the entire length of the mold and two 5-ton ladles are used in pouring. Abundant metal is blown through the risors to insure against any possible kick from cores, doing harm and also to carry off any dirt which might have, through any means, been in the mold.

The mixing and melting of the iron is under the personal supervision of the foundry superintendent, Mr. James Gibson, and is the same as is used for the Gurney Fdy., Co.'s hot water boiler castings and is all pig iron bought only by analysis. The mixture found to be most suited to the work analyzes approximately silicon 2.40, sulphur .03, phosphorus .60, manganese .70. The resultant castings will be silicon 2.05 and sulphur .07.

Solvay coke is used as a rule but 72-hour coke is sometimes used. The secret being to use enough to have the metal properly melted.

When we consider that what is termed a steam cylinder, consists of, not only the cylinder itself, but includes the steam chest and valve seat with two sets of live steam ports, exhaust steam port with pipe opening and flange leading to next cylinder as well as the pipe opening and flange for live steam intake. Also bottom head of cylinder with all of its ribs and branches, small opening with flange to receive stuffing box, and to this add the bracket to which the columns are fastened, and the branches to which the lagging is attached, we may well say that to accomplish all of this without defect requires equipment and material of the highest order and mechanics who take second place to none. The name of "Gurney" is too well known in Canadian foundry circles to require further comment.

It was our privilege to see these cylinders machined and tested as well as inspected by Lloyd's Inspector at the Engineering Works of the John Inglis Co., where some of the engines are being built and we know whereof we speak. They were first-class castings.

◆

Wm. J. Keep, for many years consulting engineer for the Michigan Stone Co., Detroit, and one of the best known writers on foundry topics, died Monday, Sept. 30, at his home in Detroit following an accident. He was knocked to the pavement by either a street car or an automobile, and succumbed a few hours later. Mr. Keep was born at Oberlin, Ohio, in June, 1842, and was connected with the foundry business practically all his life. In 1885 he brought out some results of his studies into the relation between the shrinkage of cast iron and the composition of a foundry mixture. Later, on the publication of Professor Turner's discovery that the condition of carbon depended upon the proportion of silicon, Mr. Keep demonstrated that shrinkage varied inversely as silicon. He thereupon devised a method and apparatus known as "Keep's Test" for the determination of shrinkage in cast iron, and in this way to regulate the cupola mixture. In 1892 his book "Cast Iron" was published, and is the best known product of his pen.

◆

The use of liquid ferro-manganese in steel making is being discussed in American steel circles. The advantages claimed for this method over solid ferro-manganese are an appreciable direct saving in ferro-manganese, a yield of more uniform steel, a shortening of the time of the heat, and a reduction of the temperature of the heat. Where the method has been adopted the alloy is pre-melted in an electric furnace and added in liquid form to the molten steel. The practice, says the "Ironmonger," is said to be of German origin. Swedish and German experience is said to show that on an average it saves 44 per cent. in ferro-manganese.

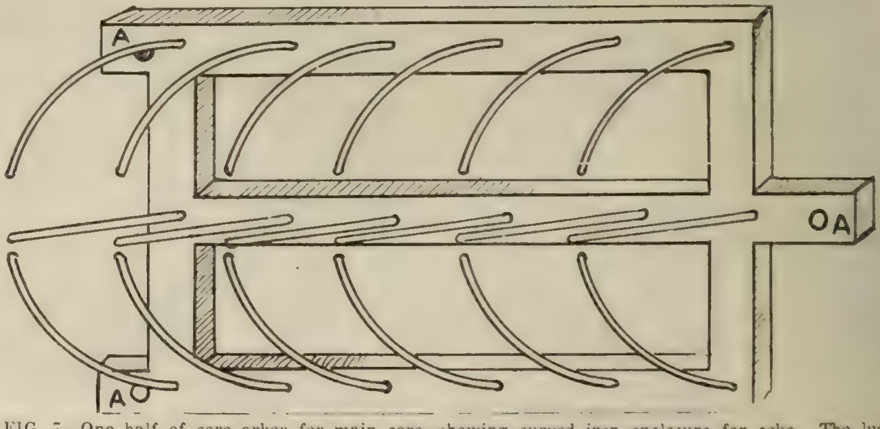


FIG. 7—One half of core arbor for main core, showing curved iron enclosure for coke. The lugs marked A with bolt holes for fastening the two halves together, project through the core and are securely fastened to the flask, making the core perfectly secure.

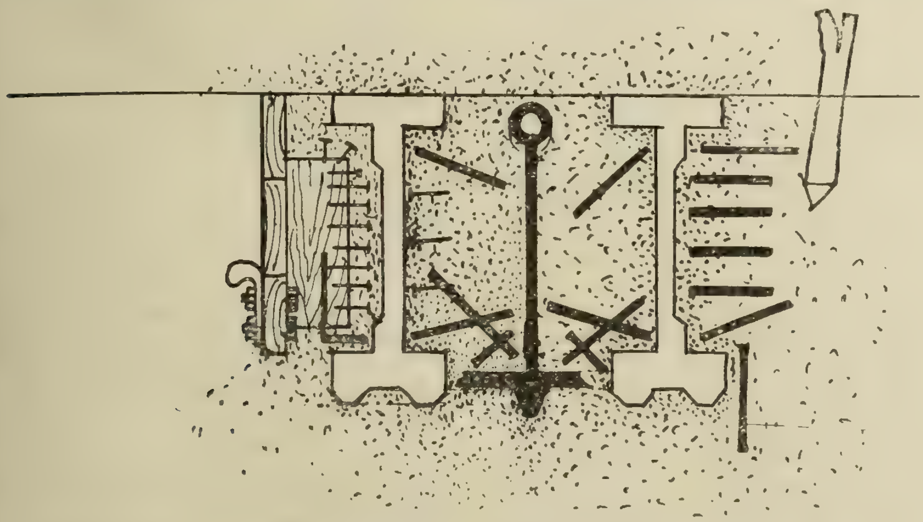
FOR THE MAN WHO WORKS IN THE SHOP

Hinged Flasks for Medium Heavy Work

For Lathe Beds and Similar Castings This Style of Flask Can be Utilized to Good Advantage

By F. G. MOLAND

THE roll-up flask has long been known and its advantages appreciated by foundrymen doing a line of work such as stove plate and agricultural implements or any similar castings. By its use it was possible for one man to roll up with comparative ease what would ordinarily have been a heavy lift for two men, and by being careful in the arrangement of patterns on the follow board a much more satisfactory job would be accomplished by rolling than by lifting. In lifting off a cope there is always more or less trouble caused through its not coming up evenly or from moving slightly from side to side. By rolling up, all of this risk is done away with, and if the hinges are properly fitted it would be difficult to go astray even by a careless workman. When match plates came into vogue it was feared that the hinged flask would soon be a thing of the past, but the various difficulties encountered were finally overcome, and to-day we have hinged flasks which are giving the best of satisfaction when match plates are being used. The hinges have upright guides which keep them in line when the flask is parted to permit of the match plate lying in the parting.


NO 1—RIGHT SIDE SHOWS HOW LATHE BED, BEDDED IN FLOOR. LEFT SIDE SHOWS SAME JOB, CHEEKED OFF WITH WOODEN FLASK.

So much for the roll-up flask on light and medium work. It is the purpose of this article to demonstrate how the flask-hinge can be utilized to advantage on moderately heavy work. Take for instance the bed of an iron lathe. Until very recent years it was a common sight to see the smallest-sized patterns of this type bedded in the floor and a cope staked off, and the inside lifted out with iron anchors; and even yet there are workmen who prefer this mode of procedure. It is difficult to understand why a workman will prefer to stand on his knees or lie on his stomach and work with his head down in a pit, but still it shows up his mechanical ability and keeps him in practice for work which has to be done this way. It was considered quite an advance or forward step in the direction of efficiency to use a cheek, even though it was only staked to the floor, and to have a complete three-part flask would be perfection for castings not too heavy to make in a flask. To make a lathe bed in an ordinary flask it is necessary to have substantial chucking on the inside of the cheek to hold the sand which has to be supported from falling or from floating. This chucking cannot be permanent as it would obstruct removal of the casting. For lathes of such proportions as are used in turning shrapnel shells it is quite possible to mold the bed in a flask and secure as good a casting as could be made in a pit and at the same time be a considerable saving in time. The large number of castings to be made from the same pattern as a result of shell orders makes it profitable and advisable to adopt the best design of flask which can be devised, and the hinge offers advantages which are not to be found in the ordinary flask. To the right of sketch, Fig. 1 is shown view of pattern bedded in the foundry floor with rods supporting overhanging sand; some of these rods are bedded in as the ramming proceeds and some are driven in afterwards. The inside shows anchor bedded into green sand core. If the pattern is solid it is done in the same way, with the exception that the core is rammed in a separate core box and lifted into the mold. The pattern of course has to be parted at the bottom so as to permit the bottom flange to be drawn in and the v's lifted separately. To the left of sketch is shown how the same pattern may be cheeked off in a wooden flask, wooden chucks being nailed to inside of flask. Iron chucks fastened together may be bolted to inside of cheek, but will have to be unbolted each time in order to shake the mold out. Fig. 2 shows end view, and Fig. 3 shows top view of the same pattern molded in flask with hinged cheek, and very little explanation will be required. The drag is rammed up on the bottom board the same as usual and the pattern bedded in. The cheek is put on in sections and clamped together as shown in Fig. 3, after which it is rammed up in the ordinary way. No anchor is required and no parting is cut on the bottom inside. The cope which is provided with guide pins is next rammed up and lifted off in

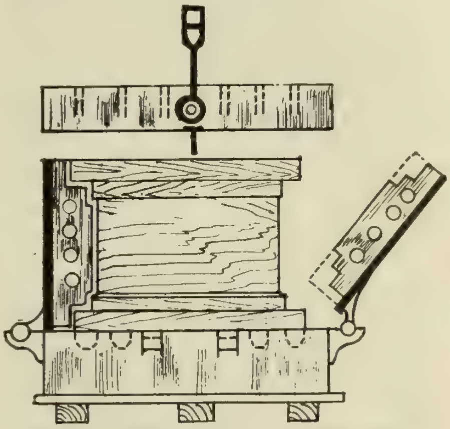


FIG. 2—END VIEW OF LATHE BED MOULDED IN HINGE FLASH.

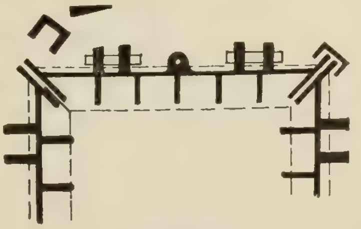


FIG. 3—TOP VIEW SECTION OF CHEEK.

the usual manner, the top flange of the pattern being loose is now drawn, after which the corners of the cheek are unclamped, allowing the sides and ends to be rolled back as shown to the right of Fig. 2. The remainder of the pattern is all in one piece excepting the part which projects into the core. This will have to be drawn in sections after the main pattern is drawn. It should be explained that before ramming the cheek pieces of tin shaped to the design of the pattern are placed in each corner as shown in Fig. 3. This does away with making partings and allows all parts of the cheek to be rammed at the same time. In clamping the corners these tins will be fastened into the joint, and when the cheek is parted they will come out. By leaving them out a space is left for paste joint and the risk of crushing is avoided.

This system of making molds has many advantages; not only for this particular casting but for many other jobs. The loose sides can be placed in any position for convenience in repairing mold, and if required can be put in the oven.

Every part of the mold is exposed to the view of the workman. When the finishing is complete the sides and ends are rolled into place and the cope closed on the same as with any flask.

The gating and pouring is the same as with any kind of flask. A lathe bed is gated with two gates at the end connected together by basin at the top, and cut into the bottom parting, in line with the sides of the casting. Similar gates may be cut in the top parting at the opposite end but not used until the mold is partly filled.

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HOLLAND'S COAL AND IRON TRADE IN WAR TIME

The degree in which Dutch industries have suffered from the war is indicated by the serious contraction of the iron trade in the last three years.

The imports of coal which reached 11¼ million tons in 1914 shrank to a little more than 2½ million tons in 1917. The exports amounted to only 58,000 tons in 1917, against 3,962 millions in 1914. The shrinkage in the iron trade has been no less serious. The imports of iron of all kinds amounted in 1917 to only 134,848 tons, against 647,224 tons in 1915. The exports in the same period fell from 171,990 tons to 7,117 tons. The deliveries of iron from Great Britain in 1916 were only a third of what they were in 1913. Since then a serious falling off has taken place. This shortage is compelling the Dutch to seek their supplies in Germany. —"Zeitschrift fur angewandte Chemie."

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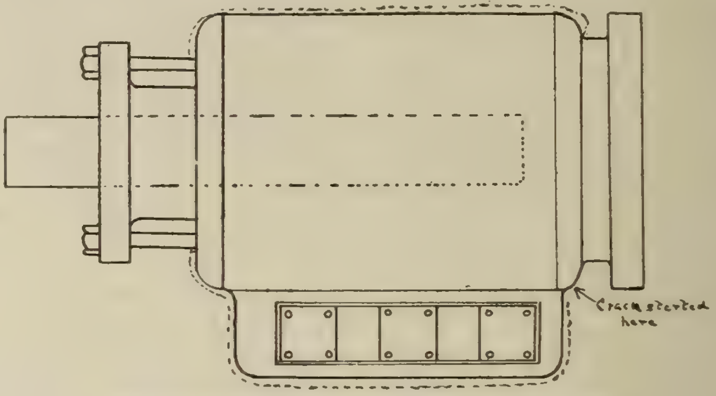
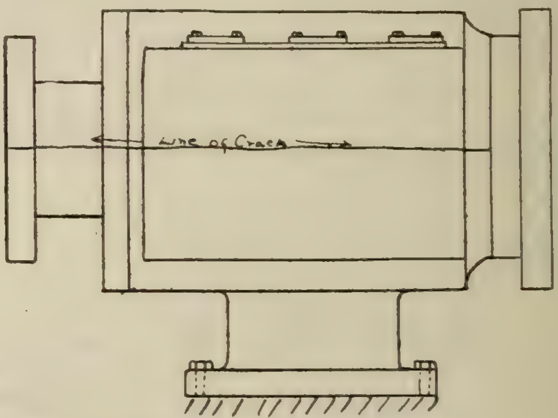
The Jeffrey Manufacturing Company have issued a catalogue No. 175 on the subject of belt conveyors which will prove of value to the manufacturer, engineer or contractor having to do with the economical handling of materials. A department from the usual catalogue has been made in that the subject of belt conveyors is treated from a strictly engineering standpoint and the purchasers requirements for information regarding capacities speeds, etc., are fully met.

FAILURE OF HYDRAULIC PUMP CYLINDERS

The writer had a peculiar experience with a hydraulic pump of the duplex type, or rather quadruple. The steam end had two cylinders 16-inch diameter by 12-inch stroke, while the water end had 4 cylinders, two in tandem each side, with plungers 5-inch diameter by 12-inch stroke, single acting. One of these water cylinders developed a slight leak in the neck of the stuffing box. It was plugged in an attempt to stop the leak, with a steel plug, on which a pipe thread had been cut, to a long taper. This stopped the leak for a time, till it broke out at a point about ½-inch further along the cylinder, but in the same straight line. This crack was about ¼-inch long, and emitted a very fine stream. A plug was put in at each end of the crack to stop it spreading, while the crack itself was allowed to leak. Shortly after the crack developed on each side of the plugs, and a new cylinder was ordered. The crack spread slowly round till it completely separated one half of the cylinder from the other, in a horizontal plane. A new cylinder having been obtained, was put in place, but strange to say developed a leak right away in practically the same place as the old one had. The makers replaced this cylinder as being faulty, and no trouble was experienced with the new one. However, shortly after the same thing occurred on another cylinder. A slight leak, almost as fine as a pinhole, started up and began to spread. Attempts were made to stop this by stitching, but to no purpose. As a matter of fact, when the thickness of the metal in this cylinder is considered, it is certain that a crack through which water could leak could not be held from the outside. The working pressure on these cylinders was 900 lbs. per square inch, and the metal was around 3 inches thick. The pump had been installed about 10 years but had only been used intermittently as a relief to the main pump. The only thing to account for the breaking down is, in my opinion, a small area of spongy metal on the inside of the cylinder, along the parting line of the pattern. This spongy area would allow the water to be forced in when the pump was working and its action would be similar to that of a wedge being driven into a crack. Through course of time this action would succeed in splitting the cylinder in halves at the parting line of the pattern. I would like to hear any other readers' theories on the matter.



PLAN—DOTTED LINE SHOWS COURSE OF CRACK



ELEVATION—LINE SHOWS CRACK.

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SPOT WELDED BRAKE HANGERS

The Portland Railway, Light and Power Co. finds that the half-ball brake hangers used on its Brill trucks can be repaired by spot welding. The repair costs less than a new part (besides eliminating delivery delays), and the repaired parts have longer life than the new equipment. The worn parts are sorted according to their condition and repaired to fit corresponding gauges.—"Electric Railway Journal."

Effects of Sulphur Overestimated in the Past

In a Paper Read Before the American Foundrymen's Association at Boston the Author Makes Some Interesting Observations on This Important Question

BY J. F. MULLAN

SULPHUR is considered cast iron's worst enemy, and many of the troubles of the foundry are laid to it whenever it happens to be high. Authorities say that sulphur combines carbon, increases hardness, shrinkage and chill; reduces strength; causes dirty iron, blow-holes and shrinkage cracks and makes iron congeal quickly. Generally, this is true, but my experience has been that sulphur, within certain limits, increases strength in soft iron. For agricultural or similar classes of castings, specifications have called for a maximum sulphur of 0.08 or 0.09 per cent. The American Society for Testing Materials, I understand, is considering increasing this limit to 0.10 per cent.

Relation of Sulphur to Hardness

In castings of this class, sulphur is generally used as an indication of the hardness. I have noticed, however, that castings with a higher sulphur, up to 0.12 per cent., will sometimes be good, strong and soft, while at other times, with the other elements the same, the castings will be hard with sulphur less than 0.09 per cent. It has been my experience that when using a mixture of 55 per cent. pig, 35 per cent. home scrap and 10 per cent. No. 1 cast scrap, and it became desirable on account of economy to substitute 0.12 to 0.15 per cent. sulphur off-grade pig iron for the No. 1 cast scrap, I could use a mixture of 45 per cent. pig iron, 35 per cent. home scrap and 20 per cent. off-grade pig. In other words, I would use 20 per cent. off-grade pig in place of 10 per cent. No. 1 cast scrap, although the average sulphur analysis of the scrap would be better than the off-grade pig. The analysis of the castings from the off-grade pig mixture would be the same, except that it would show a higher sulphur. But the iron would be just as good and just as soft as the lower sulphur iron made from the scrap mixture.

In steel, sulphur has had the same bad reputation that it has in the foundry. Bessemer steel specifications generally call for 0.08 per cent. or less, and open-hearth specifications for 0.05 per cent. or less, as the maximum sulphur limit. Dr. J. S. Unger, of the United States Steel Corp., has made some extensive tests with high sulphur in open-hearth steel. These tests, which were made with varying sulphur contents from 0.03 to 0.25 per cent., showed that good steel could be made with the higher sulphur. High-sulphur steel was made into rivets, chain, sheets, wire, tubes, pipes, forgings, wire rope, rails, etc. These tests showed that high-sulphur steel could be made with mechanical and working properties equal to that of low-sulphur steel.

Dr. J. E. Stead, the eminent English metallurgist, in a paper before the British Iron and Steel Institute, cites experiments with steel containing from 0.10 to 0.50 per cent. sulphur with as good or superior mechanical properties, as steel of lower sulphur. The following extracts are taken from his paper:

It was proved long ago that manganese counteracted the effect of sulphur, but books have been written in which sulphur was condemned, and engineers and their experts read those books and copied them, so that even to this day steel rails, etc., of exceptional quality are rejected because the sulphur exceeds arbitrary limits, even when all mechanical tests proved that material is perfect. Steel high in sulphur resembles wrought iron and is more or less fibrous. It is a fact that steel called free-cutting fibrous steel is used to-day and the peculiar properties referred to are due to the deliberate introduction of sulphur into the steel. Such material contains about 0.15 per cent. sulphur. Sulphur, then, may be regarded as a friend when it is used intelligently and is not invariably the enemy it is represented to be.

Within the last few months I have experienced some rather extraordinary cases of high sulphur iron showing up very soft. The casting used as a test piece was a small gray iron box or bushing, 2½ inches long with a ¾-inch core. The lighter portion, including the upper end is 3-16-inch thick. The heavier portion is ¼-inch thick. The ¾-inch cored hole is reamed to a 0.890-inch hole on a gang drill. This machining is done with a feed of 4¼ inches per minute. This casting is one that is liable to cause trouble in machining on account of a hard upper edge in the lighter section. Ordinarily it is not safe to run this iron over 0.10 per cent. in sulphur, and this casting has given trouble with sulphur as low as 0.08 per cent. In the cases just mentioned where the iron was satisfactorily soft, the analyses were as follows:

Lot No.	Sulphur, per cent.	Silicon, per cent.	Manganese, per cent.	Phosphorus, per cent.	Total carbon, per cent.
1	0.156	2.11	0.44	0.70	3.39
2	0.143	2.12	0.44	0.70	3.47
3	0.145	1.93	0.46	0.40	....
4	0.170	2.09	0.44	0.40	....

The casting, the small box previously referred to, machined soft from all of the four lots.

The high sulphur in lots Nos. 1 and 2 was obtained accidentally. I had already tested the castings for softness, and was very much surprised that analysis showed such high sulphur. The high sulphur in lots Nos. 3 and 4 was obtained by using high-sulphur pig and adding sulphur to the molten metal.

Not So Bad As Painted

The cases of good iron with high sulphur and many cases of poor iron of practically the same analysis but lower sulphur, lead me to believe that sulphur in itself is not nearly so bad as it has been painted. Where sulphur is blamed for poor iron, I do not say that this iron would not have been better had it been lower in sulphur, but I believe that in most cases iron higher in sulphur could be made that would give satisfactory castings.

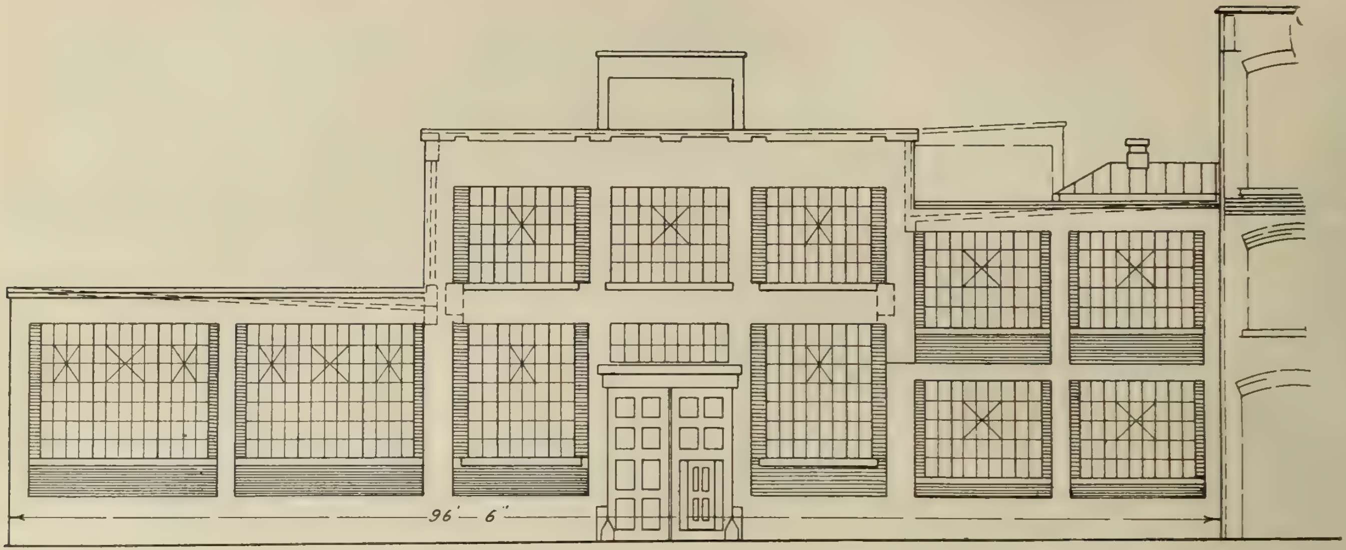
At this time I will not try to explain why some high sulphur iron makes very good castings, but I am inclined to believe that oxygen, as described in papers written by J. E. Johnson, Jr., one of which was read before this association several years ago, has much to do with it. The oxygen in the four lots cited above was very low, but I have not had the opportunity to do enough work along this line to draw definite conclusions.

COVERING CAST-IRON WITH ALUMINUM

We learn from the "New East" that a process for covering the surface of cast-iron with aluminum has been discovered and tested in practice. The iron is first galvanized or tin coated and then plunged in a bath of molten aluminum at a temperature of 700° to 800° C. While in the bath the surface is rubbed with steel brushes. The tin or the zinc goes over to the molten aluminum and is replaced on the surface of the iron by aluminum. Two or three baths are required, but the larger part of the tin or zinc is displaced by the aluminum in the first bath. The advantages of the process are: remarkable firmness of adhesion, and economy compared with pure aluminum.—"Metall und Erz."

Toronto Office. — Canadian headquarters of the International Nickel Corporation are being established in Toronto, the company having taken the entire fourth floor of one of the largest office buildings in the lower business section, which is at present being altered and handsomely equipped and furnished to house a numerous staff. The work of office organization and establishment is making rapid progress under the direction of F. P. Bernhart, of Copper Cliff, who is making his home headquarters at the King Edward.

New Grey Iron Foundry of Darling Bros.



THE steady increase in the business of Darling Bros., of Montreal, has required considerably more factory space during the past few years. While much of this has been the result of munition work the greater portion of the increased activity has resulted from the enlarged volume of orders for general contract work. The most recent expansion is in the foundry business, this development being virtually forced upon them by the existing situation created by the contingent difficulties in obtaining the necessary castings for the manufacture of their product. The inability of many foundries throughout the country to secure sufficient raw materials for their usual operations, created a situation where many essential industries—dependent upon outside sources for fundamental material—were brought to the point of establishing for themselves a source of supply upon which they could rely.

The new foundry of Darling Bros. had been under consideration for some time but was necessarily hastened by abnormal conditions arising out of the war. To meet the pressing demands for greater output the decision to construct the foundry was shortly followed by active operations, and work on the foundations was started early in the spring, and early in October the first cast was successfully made. The foundry building, which consists of the new addition and a small portion of the old structure which houses some of the auxiliary equipment, covers an approximate area of 18 000 square feet. The main portion is of the lantern type which provides abundant lighting to all sections of the floor and gallery, where the charging floor is located. The cupola now installed is of the 10-ton continuous type, and provision has been made for an additional unit of similar capacity. The blast for the cupola is supplied by a No. 4 Roots blower, with a capacity of 4,000 cubic feet of air per minute; this unit is operated from the line shaft.

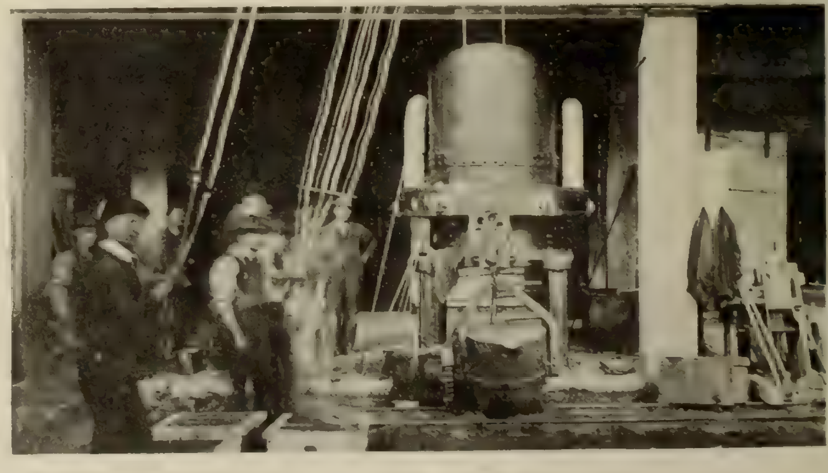
Two ladles, one of 2 ton and one of 1 ton capacity, made by the Whiting Equipment Co. are provided, each of these being fitted with improved pin spur gear opening arrangement. The core ovens are built of brick and are equipped with the necessary shelves in addition to the portable car. Balanced lifting doors are also provided. The smaller oven was installed by C. J. Woodison Co. of Detroit, and is of the stationary type, set in brick. The cores are placed on swinging shelves, which operate independently of each other, allowing of the removal of the cores without hindering the baking process of the other shelves.

The central portion of the floor, where the heavy work will be done, is provided with a 4-ton electric traveling crane, operated and controlled from the floor level.

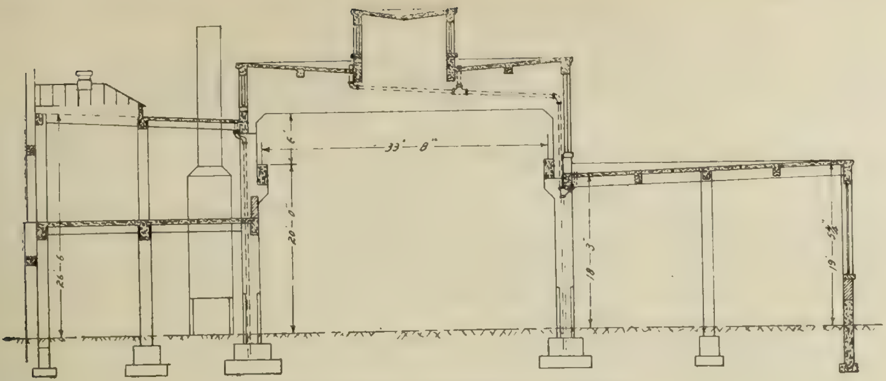
The fettling shop is amply provided for the cleaning and dressing of the castings before the same are transferred to the machine shop. The large Whiting tumbler is of the steel plate barrel variety driven off the line shaft. Emery wheel and air hammers are also provided. A power-driven elevator with a platform 5 ft. 6 in. by 8 ft., and with a capacity of 3,000 pounds, has been installed for supplying the charging floor.

The building is heated by the Webster vacuum system of steam heating, steam being delivered through a reducing valve from a 40 horse power return tubular boiler. The condensation is returned by means of a 5 x 6 x 10 vacuum pump, discharging to a receiver, from whence it is returned to the boiler by a 5 x 3 x 6 boiler feed pump in the usual way. There is installed 2,000 square feet of direct radiation divided into 14 units capable of maintaining a temperature of 60° during the most severe weather.

Adjoining the foundry and in a section of the old structure is the pattern making department. This space has been enlarged and equipped with the latest type of modern wood-working machinery. This department which was formerly located in the main building across the street, is in charge of a competent super-



POURING; DARLING BROS.' FOUNDRY



CROSS SECTION THROUGH FOUNDRY

visor of long experience and a staff of efficient pattern makers.

The primary object of the recent development was for the purpose of supplying the need of their own business, but it is expected that general contract work will also be a feature of this new activity.

T. Pringle and Son, architects and engineers, were the designers and erectors of the building and the finished structure exemplifies the latest and most efficient practice in foundry installation and operation.

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It is stated that during a recent French offensive the consumption of petrol for the army and air service was at the rate of 1,800 tons per day, which represents a daily consumption of approximately 500,000 gallons of petrol.

SUCCESSFUL WITH A "VOLUNTEER PLAN" AT THE BOWSER TANK AND PUMP WORKS FORT WAYNE, INDIANA

The Fourth Liberty Loan Campaign of the Bowser plant was conducted strictly according to a "Volunteer Plan." The Allen County, Indiana, organization put on a "voluntary campaign" and the factories were asked to join in the spirit of the undertaking.

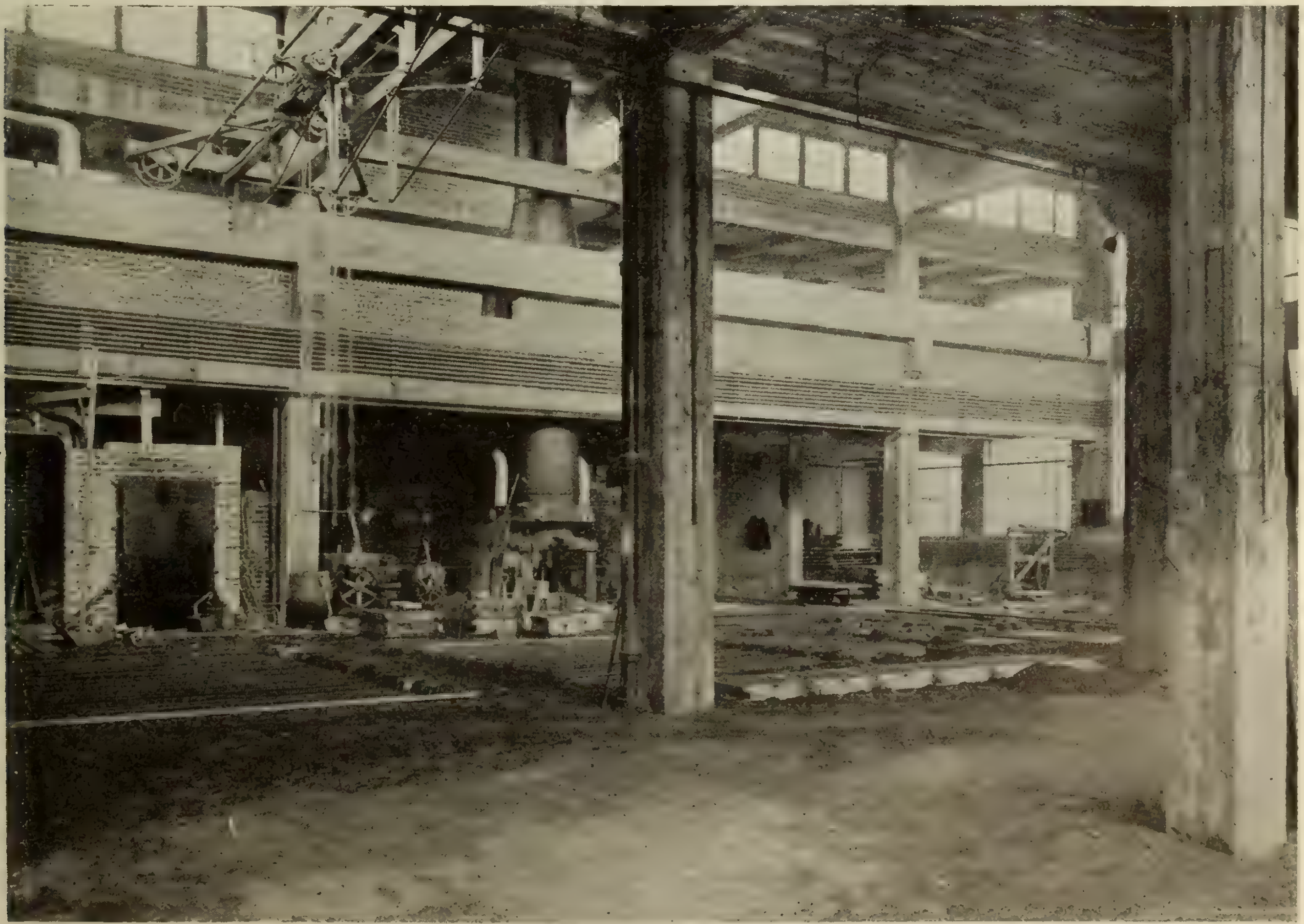
In previous campaigns a soliciting squad was organized which enlisted the services of practically 175 workers. The head of each department was designated as captain, and he would appoint as many lieutenants as necessary to get the subscriptions in his department.

This "Volunteer" campaign made it unnecessary for all of these workers to solicit the subscriptions. Everyone was urged to buy as many bonds as they could possibly afford, without being personally called upon to do so.

In consequence of the request, the old Bowser team organization which have operated in the past were not in existence. Three booths were set up in the plant where subscriptions were received. There was no soliciting—there was no urging—but every man and woman was permitted to work out the problem with his or her own conscience, and be the sole judge.

When the voluntary campaign closed Tuesday night, October first, the results were counted up and it was found that the conscience of the Bowser employees had been seriously at work without a single prompting from the old-time team organization. The employees had subscribed of their own free-will a larger amount, number of people considered, than was subscribed in the Third Liberty Loan campaign. The fact attests to the soundness of the voluntary subscription plan of a conscience campaign and at the same time speaks well for the state of health of the Bowser Conscience.

Fourteen hundred and ninety-five subscriptions were contributed to the Fourth Liberty Loan. No branch office nor salesmen's subscriptions were included in this. The firm deemed it advisable for branch office employees and salesmen to subscribe locally. The contributions were therefore solely from the home office and factory forces.



GENERAL VIEW OF DARLING BROS.' FOUNDRY, MONTREAL.

Practical Hints for the Brass Founder

IMPROVEMENTS IN THE SMALL BRASS FOUNDRY

ALTHOUGH it is the tendency for small manufacturing concerns to be absorbed by syndicates and large corporations, there are still quite a number of small brass foundries, also many iron foundries and engineering works, which run brass foundries as auxiliary departments. In the latter shops the practice is often very haphazard as the men who run them are better acquainted with iron founding. It is a comparatively simple matter to melt bearing metal in a crucible, or to melt and pour babbitt metal for a machinery bearing, but in many cases where a good bronze casting of definite strength, soundness and hardness is required, the means taken to produce these castings are very clumsy and unscientific. There is a great deal of skill required in melting and casting brass, as the melting points of the constituent metals differ so greatly that the resulting alloy may be far from what was anticipated owing to the loss through oxidization and other causes.

Copper, the basis of all brasses and bronzes possesses a melting point, when pure, of 1.950 degrees Fahr., and lead melts at 612 degrees Fahr., tin at 440, and zinc at 750 degrees.

From these figures it will be seen that copper is much harder to melt than any of the others and must be melted first, otherwise the others will be burned; zinc while requiring a high temperature to melt it, must not be heated above the bare melting point. If zinc is heated above 750 degrees it will burn and emit a greenish-white flame and fumes forming oxide of zinc, which falls about the room in flakes resembling snow. When these white flakes are seen it must be understood that the percentage of zinc in the alloy is rapidly becoming less. It is a frequent occurrence to see a melter trying to melt copper wire in a pot of melted brass without considering that the brass must be heated to a temperature of 1,950 degrees before the copper will melt, and that the zinc contained in it begins to volatilize or burn out as soon as the 750 degree point is reached, leaving a mixture nothing like what was intended, and the castings made from such a mixture will invariably be pitted.

The Furnace

The crucible furnace, fired with coke, is commonly employed for brass melting in small establishments and auxiliary departments, and to a considerable extent in the larger plants, although the advantages of the modern tilting furnaces are well appreciated. The general construction of the crucible pit furnace is well known, so that it will be unnecessary to refer to it further than to state that the dimensions of the chimney should be approximately 20 per cent. of the total grate bar area, the height varying according to local conditions, but it must be of sufficient height to be above all obstructions. The air should be allowed ready access to the fuel, through the grate bars, which should be at least an inch apart. By having good open grates and a good strong draught perfect combustion is the more nearly obtained. It is an easy matter to control a fire which has a tendency to burn too strong, but the reverse is the case when the tendency of the fire is otherwise.

In the melting of brass there is plenty of scope for the exercise of intelligence, as faults which are apparently very trifling may have quite disastrous effects. In remelting scrap or ingot brass a common mistake is made in packing the crucible too tightly with weighty pieces, and the expansion of the metal, when heated, is frequently great enough to split the crucible. When the crucible is charged with awkward and irregular pieces these commonly have to protrude from the top until the lower portion is melted, in which case care must be exercised to prevent the metal from falling over the side into the fire, and to protect the copper and other constituents from oxidization a covering of charcoal should be used. In a coke fire sulphur may be absorbed from the coke if the metal is not protected.

EFFECTS OF SODIUM AND PHOSPHORUS IN BRONZE

TO obtain some idea of the respective merits of sodium and phosphorous in bronze a series of tests were carried out by making test bars of an alloy of copper 95 %, and tin 5 %. Some of the bars were deoxidized with phosphorus and others with sodium, and they were tested by being held in a vise and twisted to determine the torsional strength. It was found that the sodium bars possessed a much greater torsional srength than the phosphorus bronze, as they withstood three complete twists before breaking off, while the phosphor bronze only stood one twist. The sodium bronze, however, was a little harder than the phosphor bronze. When bent through 180 degrees the former alloy broke, while the phosphor bronze did not. Phosphorus also possesses the advantage of not distilling out of the metal by repeated melting and is more easy to alloy. Sodium or natrium bronze is an easy running alloy, the tensile strength of which is greater than that of phosphor bronze, otherwise the two metals, when cast, greatly resemble each other. Sodium bronze, when melted, emits a yellow flame, which is caused by the distillation of the sodium. Phosphorus and sodium should never be used together in the same alloy.

THE ANALYSIS OF OLD GUNMETAL

Gunmetal is a term usually applied to a very tough and strong alloy of copper, and before the advent of phosphor bronze it represented the highest type of the alloy of copper and tin, and in years gone by was used in casting some of the largest and most powerful of ordnance. Any alloy of copper containing from 6 to 12 per cent. tin, either with or without the addition of zinc, was called gunmetal, and this series of alloys was extensively investigated by ordnance experts in order to determine which particular one was best adapted to the requirements of the service.

Some of these old guns are still in existence and make interesting study for analysts of the present day, their researches revealing many interesting facts in connection with these alloys which are of importance to manufacturers of high grade bronze castings, in that they indicate the most suitable alloy to select when castings of great strength are required. The physical properties of some of these old guns, as shown by the tests, are of the highest quality. They are almost invariably found to analyze close around 90 per cent. copper and 10 per cent. tin; some will be slightly away from this, and some would, in addition to the copper and tin, contain a small amount of zinc. While not going into details it will be of interest to note some of the results arrived at. It is shown that the alloy containing zinc has not the tensile strength of the copper-tin alloy, and that it greatly deteriorated by being remelted. This is contrary to the general belief as it has always been considered that a more homogeneous alloy is obtained by melting the metal twice.

It has also been generally believed that a small amount of zinc was beneficial, but it would seem not, according to these tests. It has also been shown that the chemical composition was never exactly the same at both ends, probably due to casting on end and remaining in a molten state so long, the component metals slightly disintegrate, the heaviest going to the bottom. It would also appear that the end with the greatest copper content would be the most tenacious. A composition of 91 per cent. copper and 9 per cent. tin and no zinc was found to show the greatest tensile strength. Another point which has been proved on other occasions is that when a composition of 90 of copper and 10 of tin is cast in green sand it is never uniform. When large molten masses begin to solidify, an alloy poorer in tin than the mixture crystallizes first where the metal is chilled by contact with the mold, its composition being about 92 parts copper and 8 parts tin. The next portion solidifying is again richer in tin, and this process is repeated as the metal continues to solidify inwardly until, as tests have shown, it is quite usual for a large casting of this mixture to be composed of 8 per cent. tin on the outside and 12 per cent. tin on the inside. It has been suggested that if cast in dry sand it might be different, but it is doubtful.

BORAX AS A DEOXIDIZER

Brass founding has undergone many changes and many improvements since my younger days, but I have on my mind one relic of old time practice which we used to consider indispensable, but which seems now to be forgotten. I still think well of it, and it might be that some reader would find himself in a position to make use of it through lack of anything better. Whenever we melted a crucible of brass or bronze we always took a piece of borax about the size of a walnut, and after the brass was sufficiently melted we skimmed it off clean and then stirred the borax through it with the poker. This formed a sort of slag on top which kept the air from coming in contact and also brought to the surface all the bubbles and impurities, leaving the metal clean.

Borax was at that time considered to be a thorough deoxidizer and purifier, and certainly did good work. We were always careful to not melt it any hotter than was actually required to make it run into the molds. For brass castings which are subjected to heat I still believe that borax is as good a purifier as anything which has succeeded it. Phosphorus is certainly better for other classes of work but is not to be used where the metal is subjected to very high temperature.

RECEIPTS FOR WHITE METAL

We have been asked for receipts for white metal, and not knowing the purpose for which it is to be used, we submit the following receipts from which a suitable one can likely be selected: Zinc 50 per cent., tin 50 per cent. Lead 80 per cent., antimony 15 per cent., tin 5 per cent. Zinc 80 per cent., tin 10 per cent., antimony 10 per cent. Copper 10 per cent., tin 65 per cent., antimony 25 per cent.

CHILLING AND CASE-HARDENING

By M. M.

These terms are applied to cast and malleable iron (or steel) goods respectively, the working results being the same, but the methods and effect on the two forms of metal being different, chilling causing the cast metal to hold the carbon in suspension in the "combined" state so far as the chilled surface is concerned, while case-hardening is produced by the metal absorbing carbon, and then being quickly quenched. Although not the same as case-hardening, the surface-hardening of copper and other non-ferrous metals can be accomplished by surface alloying with tin or other suitable metal at certain crucial temperatures, and this acts as a hardening medium much as the carbon acts on iron and steel.

In making chilled castings, the molten metal is run into or against whole or part moulds of cast iron of some thickness which at once solidifies the metal without allowing time for its constituents to separate and assume various forms as in a sand mould, suitable mixtures of iron being used, as some irons are non-chillable. The depth of the chilled parts depends partly on the iron used and partly on the thickness of the chill in regard to the bulk of the casting, but up to roughly half-an-inch chill can readily be had under suitable conditions. In cases where the whole of the metal is chilled, it becomes brittle and for this reason makes it necessary to use specially selected iron, which, by its strength, will to some extent counteract the weakness which is a characteristic of all brittle irons, but where there is a sufficient thickness, the soft metal prevents loss of strength to any great extent, while in some cases a chilled casting may very well be stronger than one which is not chilled. Chilled surfaces stand wear well, and usually have to be ground to finish them, as a file is of no effect on the hard surface, but given a sufficient backing of soft metal, such surfaces are very durable.

In case-hardening the articles are finished as to size and form, except for a light grinding where extreme accuracy is necessary, and are then packed in flasks in the carbon producing material, which is usually some form of animal charcoal plus prussiate of potash, salt, or other chemical, which is presumed to assist in the absorption of the carbon. The flasks have covers thoroughly fluted on to prevent the admission of air, and are gradually heated to from 750 deg. Cent. to roughly 800 deg. Cent. and held at that temperature for some hours. The exact temperature depends on the content and bulk of the metal, and is not constant for all things alike. but usually the variations are not great. When finished, the hardened pieces are dumped into cold water, and after being dried are finished off for use if the hardened casing is thick enough, or it may be necessary to again pack and heat them to increase the depth of the hard casing. As to the depth to which the metal is hardened, wear has to be considered, but as from a sixteenth to three thirty-seconds of an inch is as a rule ample, there is no advantage in deeper hardening, while in many cases less than the sixteenth of an inch gives all the wear required.

For thin work, heating to a full red and plunging in a hot solution of cyanide of potassium will give good results, more particularly if the heating and dipping is several times repeated; but this method of hardening usually causes the development of hair cracks, which rather spoil its effectiveness, and to some extent provide a means for rapid wear under some conditions of use. The hotter the solution is used the fewer and finer the cracks with steel, while with fibrous iron they become practically absent, but all wet treatment are rather apt to affect the surface of the metal, and this in the hands of the most skillful operator.

The advantage of case-hardening is in its providing a very wearing surface —as in the case of a wheel axle—while still retaining the toughness of the general body of the metal, in this way providing a safeguard against shocks which fully hardened metal could not withstand, this being the objective aimed at in both chilling and case-hardening. The full effect of the method is well shown in some armor plate, which will resist the penetration of shells under a certain weight and velocity, and yet not split up, although, probably some effect is produced at the point of impact provided the striking blow is heavy enough, but in any case the plate is not ruined as in the case of the non-hardened surface.

In the case of surface hardened non-ferrous metals, the effect is somewhat the same as in the case-hardened iron or steel, while in some instances there is some tendency towards peeling if the metal is bent about much, but the process has advantages for some kind of work. The metal to be treated is freed from oxide as far as possible, fluxed, and sufficiently heated from underneath, the hardening metal being melted on the upper surface and well rubbed in until it alloys with the metal to be hardened. Surplus metal is then wiped off and the treated object allowed to become cold, when it is finished in the most convenient way. Copper can be made so hard with tin that a file will scarcely touch it, while other things can be made surface hard, aluminum, possibly, being an exception, as under heat it does not behave like other commercial metals, although phosphorous eases the situation to some extent. Provided someone would produce an easy method of surface-hardening aluminium, however, and that without sensibly increasing its weight, the thing would be of much value if only imparting rigidity, but it is not required for more than surface-hardening, and not general alloying purposes.

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Germany has come to the end of her tether in many vital raw materials not produced in enemy countries. Teuton factories are, and will be more, hungry, therefore, for raw materials when the war is over. Germany cannot manufacture without them. Does she deserve any contribution in raw materials from Canada? Germany, for her own domestic requirements and export trade, will be in the market for enormous supplies of raw materials which, with the demands of these portions of Europe which have been devastated, will tax for some considerable time the rest of the world to supply.

Two-Ton Electric Furnace Makes Alloys

Heroult Furnace Used For Non-ferrous Alloys—Description of Plant and Equipment

An electric furnace, whose main product is nichrome, the well-known high-temperature resisting alloy, has recently been installed at the plant of the Driver-Harris Co., Harrison, N.J. The furnace is of special interest because of its electrical equipment, which is an excellent example of modern practice. Alloys of various characters are also manufactured by the furnace. It is of the Heroult Arc type, featured with automatic regulation, and has a capacity of two tons.

The amount of power taken at the start of the heat is small, but as the resistance of the furnace circuit decreases, owing to the heating up of the electrodes and the consolidation of the charge, the power consumption rapidly increases until stable conditions are reached. The average amount of power consumed is then held practically constant by the automatic regulator, with the exception of a slight continuous increase, due probably to a corresponding decrease in the resistance of the furnace circuit.

There is, however, no uniformity in the actual power consumption. As the charge melts down, pieces of metal fall between the electrodes and establish short circuits. For the most part these short circuits are only momentary as the fragments causing them are promptly melted down, but occasionally they persist, and then the automatic regulator draws up the electrodes until they are clear. This process sometimes breaks the arc and then there is a sudden decrease in the power consumption until the regulator brings the electrodes down again and re-establishes the arc. As would be expected steel alloys show more of these irregularities than the softer nichrome.

Towards the end of the run there is a marked change in the power consumption when the metal is given a special treatment before pouring. In the case of the nickel steel a higher temperature was necessary, perhaps to lower the carbon contents, while with nichrome the temperature was lowered. The temperature of the furnace averages about 2,200° Fahr.

The high momentary overloads are characteristic of electric furnace work and make it very different from ordinary power service. They must be taken into account in designing the electrical equipment for the furnace, and some of the apparatus must be specially designed to withstand them, as shown in the following description of the Driver-Harris installation.

Power for this furnace is furnished in the form of two-phase, 60-cycle, 2,200-volt current from the lines of the Public Service Electric Co. In the high tension lines are a disconnecting switch and an oil circuit breaker. This latter is used to control the circuit. It can be operated manually and is also provided with low-voltage and overload protection. In order to prevent its operation on momentary overloads, the overload trip is controlled by relays with definite inverse time-limit action. The high tension apparatus and the transformers are contained in a brick compartment behind the furnace.

There are two 400-kva., 2,200 110-volt transformers of the oil-insulated self-cooled type. They are Scott-connected so that they change the high-voltage two-phase current into low-voltage three-phase current, one phase for each of the three electrodes of the furnace.

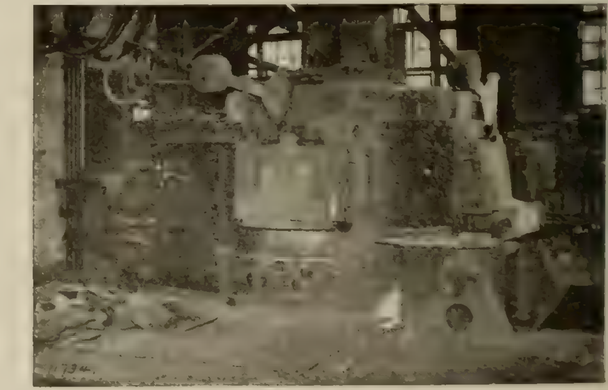
Special construction is necessary to withstand the overloads. These overloads are of such short duration that their heating effect is negligible, but they tend to force the coils apart. Hence the coils are very firmly braced and are in fact capable of withstanding momentary overloads fifteen times greater than the normal load.

The reactance of these transformers is about double that of ordinary power transformers of the same size. This re-

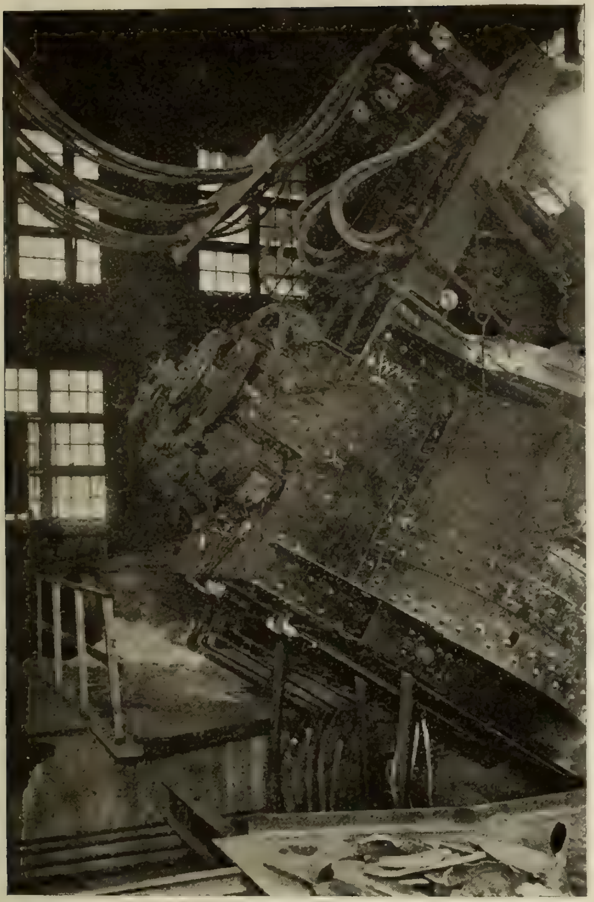
FURNACE DURING MELT

THURY REGULATORS, RHEOSTATS AND CONTROLLERS

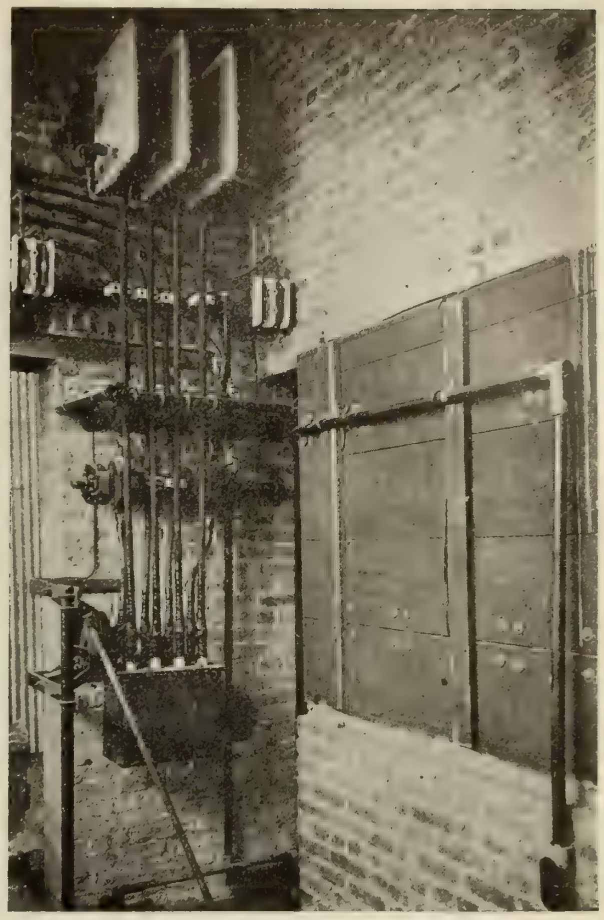
FILLING THE LADLE



2-TON HEROULT FURNACE



REAR VIEW OF FURNACE SHOWING WINCH MECHANISM



INCOMING LINE AND OIL SWITCH

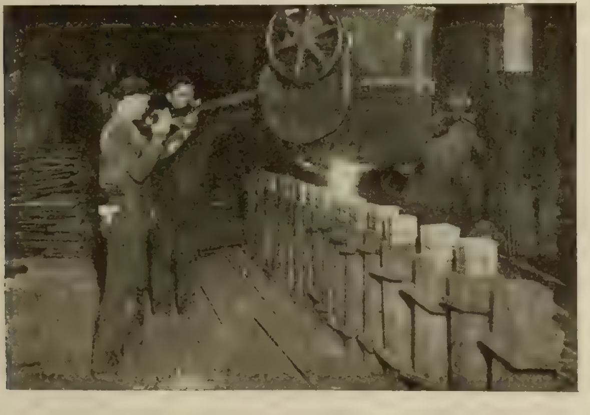
actance together with that developed in the low tension leads (which are made as short as possible in order to keep this factor low) prevents the current flowing through the furnace from exceeding five or six times normal values even on dead short circuits. The voltage regulation is from 106 volts on no load to about 100 volts on full load, and the power factor is from 85 to 90 per cent.

One of the most interesting features of the equipment is the Thury regulator, which automatically maintains an approximately constant current at the furnace electrodes. Without this device the current consumption would vary eratically even if an operator were constantly endeavoring to correct the variations. It therefore saves labor and current, reduces to a minimum the time required to prepare a charge, and by providing uniform conditions keeps the quality of the product uniform.

Each furnace electrode has a separate regulating mechanism and a raising and lowering motor. The regulator can be set for any desired current value, and when this value is exceeded each regulating mchanism closes a contact momentarily, which causes the motors to raise the electrodes slightly. The contacts continue to close at brief intervals until the electrodes are drawn up high enough to reduce the current to the predetermined value, the intermittent action being employed to prevent the electrodes from being raised too high and thus causing an unstable condition. When the current falls below the predetermined value the electrodes are lowered in a similar manner. The regulator itself is controlled by a solenoid energized by means of current from series transformers in the main high-tension circuit. Damping devices prevent the regulator from acting on overloads that immediately correct themselves.

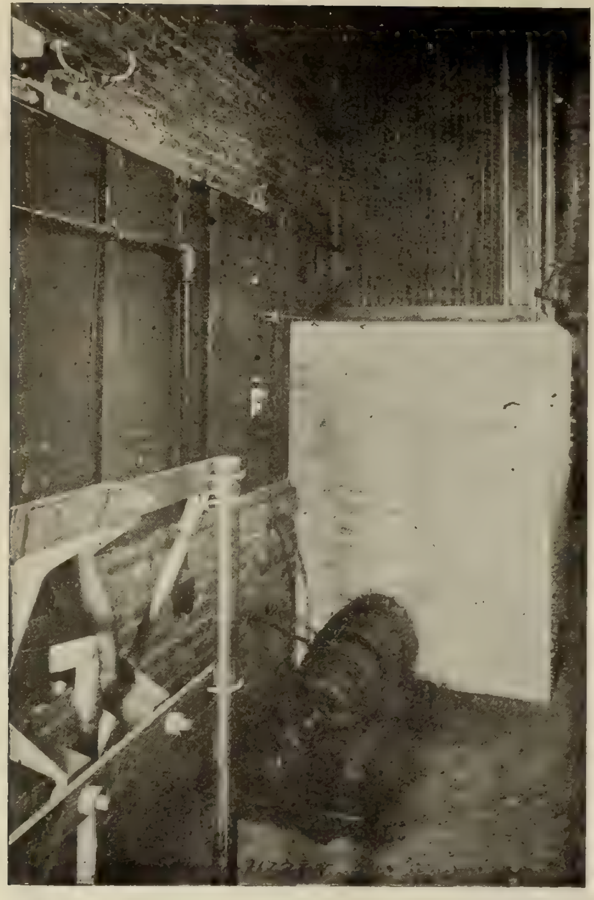
In addition to the automatic device, each electrode motor has a drum controller for manual operation.

The electrode motors are direct-current machines, because alternating current motors cannot be controlled with sufficient delicacy. The operating current is obtained from a 4½ kw. motor-generator set located in the transformer compartment. The motors are 2 h.p. capacity and are totally enclosed. They are provided with grease-cup lubrication instead of the ordinary ring-oiling sys-

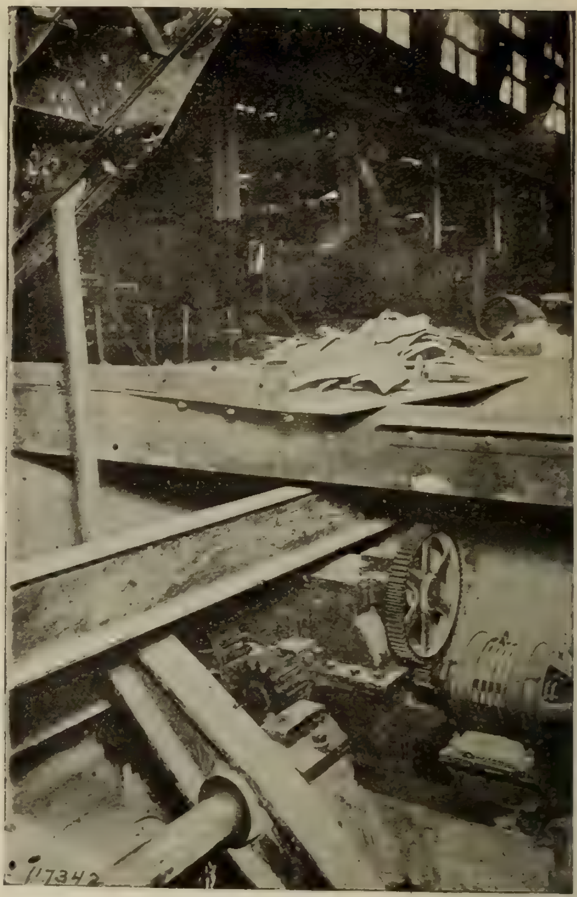


POURING THE INGOTS

FURNACE IN TILTED POSITION



WESTINGHOUSE TRANSFORMER MOUNTED ON PEDESTAL TO SHORTEN LENGTH OF SECONDARY LEADS. BELOW: MOTOR GENERATOR SET FOR CONTROL MECHANISM



TILTING MECHANISM AND COUNTERWEIGHT SHAFT. WESTINGHOUSE MOTOR USED

tem so that the lubrication is not interfered with when the furnace is tilted for pouring.

An instrument board is located beside the regulators and carries the following apparatus: A kilowatt meter; a volt meter; a power factor meter; an ammeter for each phase; a graphic wattmeter; a plug switch for reading the voltage of each phase, both across the arc and across the low-tension leads outside the furnace; the operating handle of the high-tension circuit breaker; the inverse-time-element relays for the circuit breaker, and an integrating kilowatt-hour meter.

On the other side of the regulator is mounted a small panel carrying the switches and meters for the motor-generator set, below which is the motor auto-starter.

When the charge is finished the whole furnace is tilted bodily for pouring. This tilting is effected by an 11-h.p. alternating-current slipring motor located in a pit beneath the furnace and geared to the tilting mechanism. It is controlled by a drum controller by the side of the furnace.

The regulating, tilting and control equipment was supplied by the Westinghouse Co.

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CONTROL OF COOLING IN CASTINGS

By M. E.

For preventing the difficulties and defects that arise from the uneven contraction of irregular masses of metal after casting, Mr. Cecil Greenhill, of Gloucester, has patented a method which depends on the application of electrical heat to the thinner and less dense parts of the castings, with the object of keeping their falling temperatures the same as those of the thicker and denser parts. As the method of application he suggests casting runners or ribs on the thinnest sections and applying heat electrically by dropping electrodes into the molten metal and allowing the preliminary cooling to 1,300 deg. C., to make the joint. In cooling the thinner sections more rapidly than the thicker ones but if an electrical current is passed through more heat will be developed in the thinner ones because they have greater electrical resistance than the thicker ones. The amount of current required would not be so large as might appear at first sight, since only losses of heat have to be replaced. It would, therefore, not be anything like so great as would be required to heat bodies of metal up to the temperatures at which they are treated, and it would be designed merely to keep the thinnest portions at the same falling temperatures as the thickest ones. The method of procedure might be varied so that the current might be used either through the whole range of temperature in cooling or through portions only. In the case of steel it need perhaps be applied only at the critical periods of steel formation, say, between 1,300 and 1,050 deg. C., after which the casting might cool naturally without harm. Or the casting might be kept at 1,050 deg., and in shapes where the mould could be stripped the mould might be removed and the casting placed in the annealing furnace, thus saving re-heating to this temperature for annealing.

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INFLUENCE OF WAR CONDITIONS IN THE QUALITY OF GERMAN IRON

In the course of his explanation of the debased quality of German iron castings made under war conditions, Professor Osanne points out, as the cause of the undue hardness, with its bad consequences, a lack of silicon in the metal. Analysis frequently shows a percentage as low as 1.5 and 1.0. Moreover, the produce of one and the same blast-furnace varies in silicon content between 1.5 and 3 per cent. The difficulty is due to the interruptions of the supply of raw material. The requisite proportions are maintained as far as possible by an addition of scrap. But there is necessarily a falling off in silicon with every melting. Besides silicon there is a corresponding diminution of magnesium content. To make matters worse, the proportion of sulphur and phosphorus is, from the same causes, no longer under control. The writer, in suggesting remedies, recommends the use of larger quantities of Luxembourg pig iron.—"Giesserei Zeitung."

Heat Treatment and the Hardening and Tempering of Steel

By Prof. C. A. Edwards, D.Sc.
Metallurgical Dept. Manchester University

Heat treating of steel must depend to a large extent upon its carbon content and upon its other constituents. The author, before the Manchester Association of Engineers, gives interesting facts relative to heat treating in general

THE very wide variety of steels which are used in the industries of the present day are somewhat arbitrarily classified into two groups. These are the carbon steels and the so-called special steels.

As regards carbon steels, the chief elements other than iron, which are almost invariably present in this class are carbon, manganese, silicon, sulphur and phosphorus. Phosphorus and sulphur may definitely be regarded as impurities; phosphorus renders the metal "cold-short," whilst sulphur makes it "hot-short" or brittle when at a forging temperature. The presence of small quantities of silicon in carbon steel is often a distinct advantage, especially when considering the casting properties of the metal. With the correct amount of silicon present, the formation of blow holes can be prevented, and the contraction which takes place during solidification can be reduced to a minimum, which means less trouble as regards "piping" and "drawing."

In all carbon steels the presence of a certain amount of manganese is essential. The action of this element is twofold: (1) It reduces any oxide of iron which may have formed in the steel during the final stages of its manufacture, and since the influence of very small percentages of oxide of iron is so highly deleterious as to make it almost impossible to forge the material, the first action of manganese is that of a cleanser of the liquid metal. (2) An excess of manganese over that required to deoxidise the metal is necessary to combine with the sulphur present, and thus convert that element, from the objectionable compound sulphide of iron into the relatively inert compound sulphide of manganese.

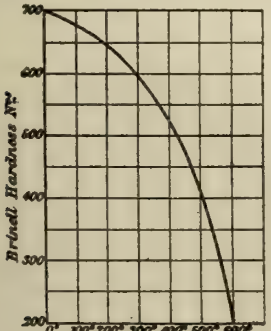


FIG. 1—TEMPERING TEMPERATURE.

Carbon.—This is the most important constituent of all steels. As regards annealed carbon steels, the influence of carbon is more or less progressively to raise the ultimate stress from, say, 18 ton per square inch when no carbon is present, up to something of the order of 40 tons with 0.90 per cent. of carbon. A still greater variation in the proportion of these steels can be brought about by subjecting them to different heat treatment. Briefly, heat treatment may be stated to consist (1) of hardening the metal by quenching from a temperature which depends upon the carbon content, and (2) tempering the hardened material by heating to certain low temperatures which are selected in accordance with the particular properties it is desired to obtain. It may here be useful to note, that providing the quenching is properly conducted, the degree of hardness that is attained increases more or less proportionately as the carbon percentage is raised to 0.90.

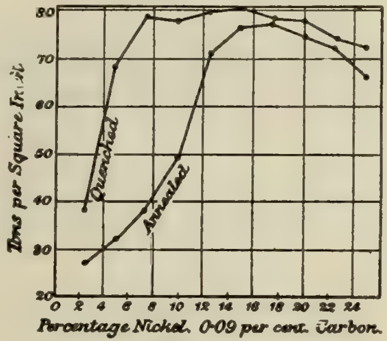


FIG. 3

It is quite unnecessary, even if there were time and space at the author's disposal, to attempt to give a detailed description of the facts relating to the cause of the hardening that is produced as a result of this simple quenching treatment; and still less is it desirable to give an account of the many conflicting theories which have been advanced to explain why the hardness is thus increased. Nevertheless, it will be advantageous briefly to draw attention to one or two of the more salient features in this connection, because they will make it more easy to appreciate the peculiar properties of special steels.

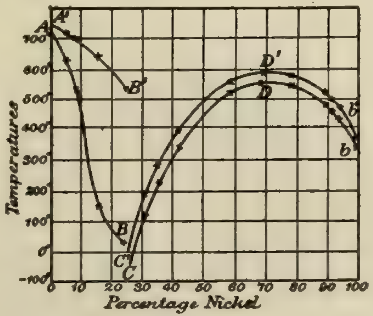


FIG. 2.

In the completely annealed or soft state the carbon exists as carbide or iron, Fe_3C, distributed throughout the mass of iron. When this mixture is heated no physical change occurs until a temperature of 700 deg. C. is reached. At that temperature, however, what were previously independent crystals of the compound Fe_3C, and iron, cease to exist, the carbide is dissolved by the iron. This change is accompanied by an evolution of heat.

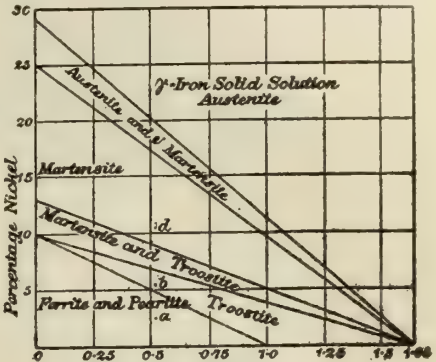
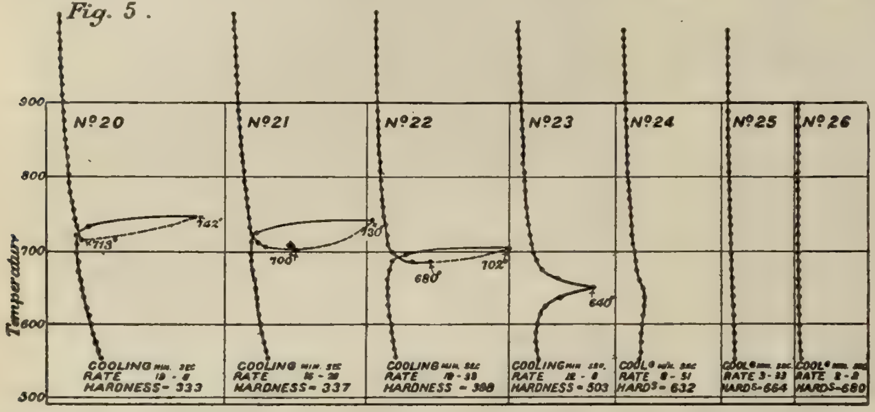


FIG. 4—NICKEL STEELS.

The action of the above constituent in steel, when heated to 700 deg. C, is in many respects similar to that of the two solids, ice and salt, when they are brought into contact at a temperature above minus 21 deg. C. The only difference being that in the latter instance the solution which is formed is liquid, whilst in the former it is solid. In both cases the original constituents can be separated from solution by cooling when the latent heat of solution is again given out.

Before carbon steel can be hardened by quenching it must be heated to and quenched from a temperature it which the carbide of iron is in solution. If the quenching is sufficiently rapid it prevents the separation of the carbide and the evolution of heat which accompanies that change, and it is the forcible retention of the carbide in this state which causes the hardening. If a carbon steel such as is used for machine-cutting purposes is hardened to its maximum degree, it would possess a very low elastic limit and would consequently be quite brittle.

The well-known operation of tempering is applied to remove this initial brittleness and the internal stresses which are set up in the quenching treatment. The change of hardness that is brought about by tempering carbon steels at different temperatures is qualitatively illustrated in Fig. 1, page 267; the softening is due to the carbide of iron which was kept in solution, by the sudden cooling from high temperatures, being again deposited. Since the amount of carbide in solution can be regulated by controlling the temperature of tempering, it will be seen that any combination of properties between the extremely hard and brittle and the relatively soft annealed states can be obtained. The same results can be produced, though the operation is by no means so readily standardized, by quenching the metal in different mediums or by varying the temperature of theh quenching liquids. In both these circumstances the action is to vary the rate of cooling, and this governs the temperature at which the carbide change tends to take place, and also the amount of that transformation which actually occurs.



(5404.d) *Initial Temperature, 1,200°C. Influence of Initial Temperature on Critical Cooling Velocity.*

FIG. 5.

With carbon steels it is only possible completely to harden the metal if the mass of steel is small. In other words these remarkable differences in the properties are produced by comparatively slight differences in the rate at which the mass is cooled from the high temperature. For example, the exceedingly hard state is obtained if the time taken in cooling down from, say, 900 deg. C, is only a few seconds, but the metal is quite soft if the time taken to cool over the same range of temperature is something of the order of 5 minutes. Hence, it is obviously impossible to bring about any material change of hardness or tensile properties throughout the mass of a large carbon steel forging by modifying the rate of cooling. With special steels, however, this difficulty is completely overcome by the introduction of such elements as nickel, manganese, tungsten, chromium, etc, which may be regarded as producing the same effect as is attained by quenching ordinary carbon steels.

Broadly speaking, the above and other elements lower the normal temperature of the carbide change, and thus influence the general mechanical properties of the mass in a manner similar to that of rapidly-cooling carbon steels. By varying the percentage of these special constituents the temperature of the carbide change can be lowered to any degree down to the atmospheric temperature, and, in consequence of this, steels with almost any desired combination of properties can be readily obtained. There is one great advantage in the use of these special steels, namely, their properties are modified from within, and therefore, practically the same quenching effects are obtained through the whole mass.

In a lecture of this kind it would be impossible to give anything like a complete description of the properties of all the special steels which are in use, but it is hoped that, by taking a few typical examples of some of the more interesting cases, members will be able to form a fairly good idea of the action of the special elements which are used in modern steel metallurgy.

Nickel Steels.—The influence of nickel upon the thermal critical points of iron is shown diagrammatically in Fig. 2. The line AB shows the position of the critical points as they occur when the specimens are slowly cooled from moderately high temperatures. This curve, which also depicts the transformation from the non-magnetic into the magnetic state, indicates that with about 25 per cent. of nickel the change does not take place until the atmosphere temperature is reached. Therefore, with 25 per cent. of nickel and a very small percentage of carbon, the steel is non-magnetic at 0 deg. C. If, however, such a sample is cooled to below 0 deg. C. the magnetic transformation is effected, and these properties are retained even when the temperature is subsequently raised to above 500 deg. C. The corresponding changes with lower percentages of nickel and a rising temperature are illustrated by the line A′ B′.

It follows from what has just been said that steels containing from 0 per cent. to 25 per cent. of nickel when at temperatures, within the A, B B′, may be either non-magnetic or magnetic according to whether they approached those ranges of temperature by being heated or cooled. This group of steels is, therefore, known as the irreversible series, because the magnetic transformation is

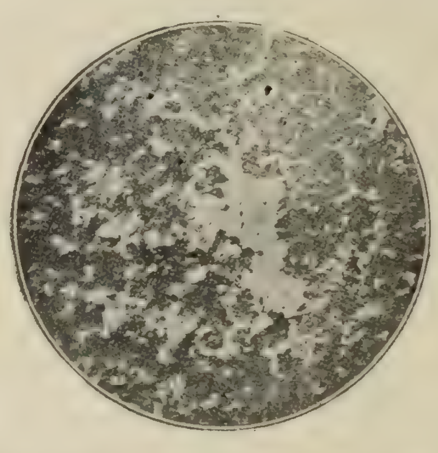
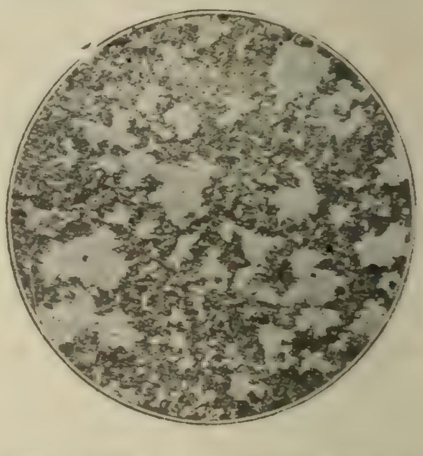


FIG. 7—AFTER CURVE 22.. COOLING VELOCITY 12 MIN., 33 SEC.; HARDNESS 398.



AFTER CURVE 21: COOLING VELOCITY 16 MIN., 28 SEC.; HARDNESS 337.

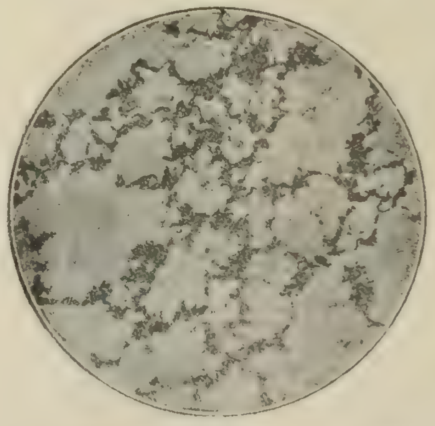
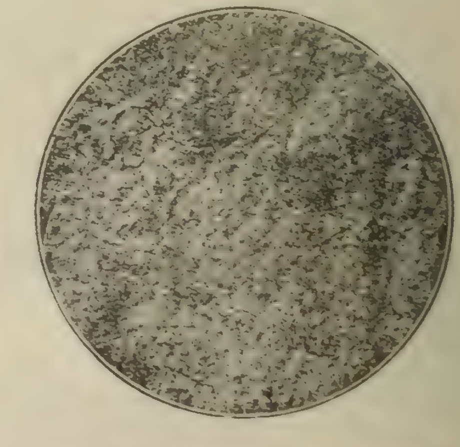


FIG. 8—AFTER CURVE 23: COOLING VELOCITY 12 MIN., 8 SEC.; HARDNESS 503.



AFTER CURVE 25: COOLING VELOCITY 3 MIN., 35 SEC.: HARDNESS 664.

not a reversible reaction as regards constancy of temperature.

Some idea of the effect of nickel upon the tensile strength of iron will be obtained from a glance at Fig. 3.

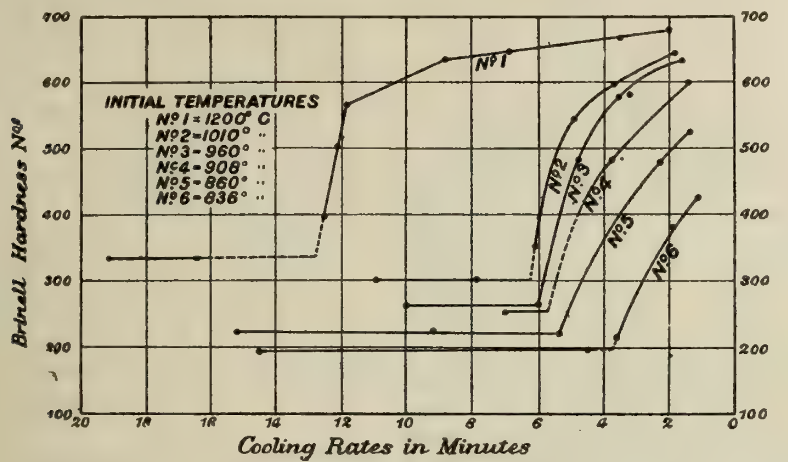


FIG. 10—EFFECT OF INITIAL TEMPERATURE ON CRITICAL COOLING VELOCITIES AND HARDNESS.

In this diagram the lower curve represents the tensile strengths of slowly-cooled specimens, whilst the upper one corresponds with the quenched materials. With the introduction and increase of carbon up to 0.9 per cent. to the nickel-iron alloys, the effect is more rapidly to raise the tensile strength, in other words, the carbon acts in the same direction as an increased percentage of nickel. Thus, for example, with no carbon the maximum ultimate stress is obtained with 15 per cent. of nickel, whilst with 0.9 per cent. of carbon practically the same properties are produced with only 7 per cent. of nickel. One interesting result of this has been indicated by Dr. Guillet, as follows:

From the diagram Fig. 3 it will be observed that a slowly-cooled steel with 7 per cent. of nickel and less than 0.12 per cent. of carbon has a tensile strength of 35 tons to 38 tons per square inch, an elastic limit of 25 tons to 28 tons, and elongation of about 30 per cent. When it is remembered that a steel containing the same amount of nickel along with 0.9 per cent. of carbon, possesses, even after slow cooling, practically the same mechanical properties as a hardened cutting tool, it will be readily recognized that such facts can be advantageously utilized for certain special purposes. Starting with a steel containing 7 per cent. of nickel and 0.10 per cent. of carbon, it is possible by simply carburizing the surface and then allowing the article to cool slowly, to obtain the same results as by carbonizing and quenching an ordinary mild carbon steel. If this is done with the necessary care all the worries which accompany case-hardening by quenching can be avoided.

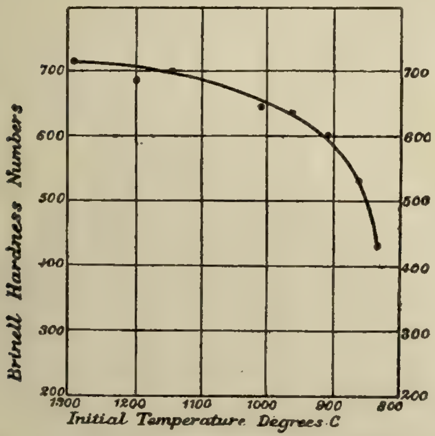


FIG. 11—EFFECT OF INITIAL TEMPERATURE ON HARDNESS WITH AIR COOLING.

As a result of investigating a large number of nicked steels, Dr. Guillet has constructed a diagram (Fig. 4) which summarizes the data he got.

Whilst this chart is a very useful one, particularly as regards the effect of varying compositions upon the internal structure of the steels, there are certain defects which need a more complete explanation than he has given. Perhaps the most important point in this connection is that no account is taken of the influence of initial temperature and rate of cooling. The question of time is an extremely important one and, as I hope to show later, it needs very careful consideration. In fact, it is the author's opinion that metallurgists will in the future have to pay far more attention to the quantitative examination of the time factor than they have generally done hitherto. The necessity of studying the influence of time becomes particularly manifest when we come to consider chromium steels.

Chromium Steels.—Until quite recently different investigators held diametrically opopsite views as regards the function of chromium in steel. Some were of the opinion that this element tended to retard the carbide transformation and thus render the steel more or less self-hardening, whilst others maintained that it both raised the temperature of that change and facilitated its completion. Recent work has shown that this diversity of opinion was due to the influence of the time factor not being properly appreciated.

When making experiments with a steel containing a little over 6 per cent. of chromium and 0.63 per cent. of carbon, the author observed the following facts: Specimens, 1 in. cube, were heated to 1,000 deg. C., and then allowed to cool in the following manner—one was taken out of the furnace and allowed to cool on an asbestos pad, in still air, taking about half an hour to reach the ordinary temperature, and the other was more slowly cooled in the furnace, the time taken being about an hour. The former was extremely hard, but the latter was quite soft. The hardness values were:

	Brinell Hardness No.
Cooled in air	642
Cooled in furnace	281

These facts clearly demonstrate that the rate of cooling plays an important role in determining whether the steel becomes what is known as self-hardened or not, and they lead to a thorough investigation of the influence of time and temperature upon the hardness of this and other chromium steels.

For this purpose specimens, 1 in. cube, were heated in a small electrical-resistance furnace and then cooled at varying rates. In order to obtain the necessary variations in the rate of cooling, the samples had to be moved to different positions inside, and in some cases outside the furnace. In all experiments accurate cooling-curve data were taken and hardness determination made.

A typical series of cooling curves are given in Fig. 5, along with the corresponding rates of cooling and hardness values. A few representative microstructures are also given in Figs. 6, 7, 8 and 9. The curves and data in Fig. 5 are particularly instructive, for they give a clear indication of the close connection which exists between the character of the carbide critical point and the hardness of the steel. Comparing the curve No. 20 with No. 21, it will be noticed that the increased cooling rate has lowered the temperature at which the carbide change commenced, but in spite of this, when the transformation once began, the evolution of heat was so great as to cause the temperature of the mass to be raised from 700 deg. up to 730 deg. C. In curve No. 22 the change did not begin until 680 deg. C., and the heat that was then developed was not sufficient to give such a high rise of temperature as in curve No. 21. With curve No. 23, which was only 25 seconds quicker than the previous one, the character of the point is quite different; there is no real rise of temperature, but merely a retardation in the rate of cooling, and it will be observed that this comparatively slight acceleration in the cooling rate has produced a material increase in the hardness of the steel. With still quicker rates, the carbide change can be completely suppressed, and when this is accomplished the maximum hardness is attained. The structures in Figs. 6, 7, 8 and 9 confirm this, the dark areas represent those in which the carbide has fallen out of solution whilst the light areas correspond to an extremely hard constituent wherein the carbon has been retained in solution.

Similar results got with the same steel when cooled from different initial temperatures are plotted in Fig. 10, page 268. Here it will be seen that as the initial temperature is raised the rate of cooling may be decreased to a considerable extent and hardening of the metal is still brought about. In other words, the critical rates of cooling which are represented by breaks in the respective curves become longer as the initial temperature is raised. It should be noted that the rates that are plotted in this diagram are strictly comparable, that is to say, they are times taken to cool the specimens over a given range of temperature which was the same for all experiments. The hardnesses that were obtained for this steel when cooled in the air from varying initial temperatures are plotted in Fig. 11, page 268.

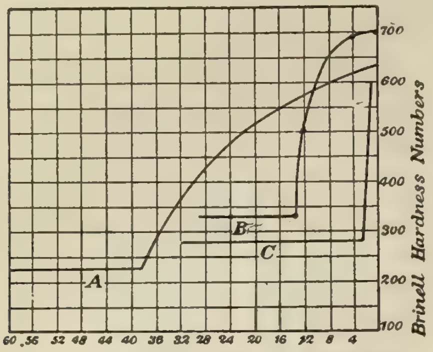


FIG. 13—COOLING RATE IN MINUTES.

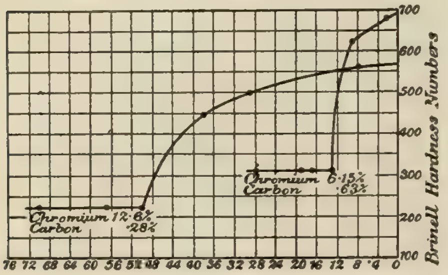


FIG. 12—COOLING RATE IN MINUTES.

The critical cooling rates at which hardening of the steel becomes evident that have been referred to above ar not only influenced by the temperature from which the cooling commences, but also by the carbon and chromium content of the metal. To illustrate this it is only necessary to compare the results that have been got for three other samples, with those that have already been described.

If we first consider a steel containing 12.6 per cent. of chromium and 0.28 per cent. of carbon, after cooling at various speeds from 1,200 deg. C., we find that its hardening characteristics are widely different from those of a steel with 6.0 per cent. chromium and 0.63 per cent. carbon. The hardness-rate data for the two specimens are plotted side by side in Fig. 12. The hardness of the two samples in the annealed state—represented by the horizontal branches of the two curves—are substantially different, and there is a similar difference between the maximum hardness obtained by quick cooling. Perhaps the most interesting feature is that with 6 per cent. of chromium, the cooling rate at which hardening appears is 12.5 minutes, whilst the corresponding rate for the steel containing 12.6 per cent. of chromium is 50 minutes. An even better conception of the effect of composition in this connection will be gained by an examination of the curves in Fig. 13, which relate to steels having the following compositions.

	Chromium.	Carbon.
A	6.18	0.37
B	6.15	0.63
C	6.16	0.97

In this series the chromium is practically the same in each case, whilst the carbon varies from 0.37 per cent. to 0.97 per cent. It will be seen from the respective curves in Fig. 13, that sample A was more readily hardened than B, but that B was more easily hardened than C. This statement is not intended to apply to the degree of hardness which can be attained, but purely to the critical cooling rate. These facts lead us to rather a novel idea from a metallurgical standpoint, for it would appear that by starting with a steel containing 6 per cent. of chromium and 1 per cent. of carbon, if the carbon content could be reduced in any given part of an article to something below 0.60 per cent., it would then only be necessary carefully to adjust the rate of cooling to get those parts with the low percentage of carbon intensely hard whilst the other portions would remain relatively quite soft. In other words, by a process of decarburizing any required surface it should be possible to produce the well-known case-hardening effects which are now produced by carburizing other steels.

Some rather crude laboratory experiments have been made in this direction, and the results have shown that case-hardening can be accomplished in this way. Whether this is likely to prove to be of any real practical value or not the author is at present unable to say, but it would be well worth making further experiments with that in view. It might be possible to control the process as easily as the carburizing of the nickel steel already cited, and if that is found to be the case, in ordinary times the chromium steel should be considerably cheaper.

Tempering of Chromium Steel

For discussing the influence of chromium upon the tempering properties, attention will be confined to one example which has been selected on account of its indirect bearing on the question of high-speed cutting tools. Results are plotted in Fig. 14, which illustrate the effect on the hardness of tempering a hardened steel, containing 6 per cent. of chromium and 0.63 per cent. of carbon, at progressively increasing temperatures. These results may be summarised as follows: As the temperature is raised to a little above 300 deg. C., the Brinell hardness falls from above 700 to well below 600. After heating between 300 deg. and 500 deg. C. the hardness becomes a little higher than it was after treating at 300 deg. C. With temperatures above 500 deg. C. there is a rapid fall in the Brineil hardness. It should be noted that the percentages of chromium and carbon in this steel are the same as are usually present in a high-speed cutting tool; there is, however, no tungsten present, and without that element such a steel cannot be used for cutting at high speeds.

Tempering of Tungsten Steel

The effect of heating a hardened steel containing 0.63 per cent. of carbon and 19.28 per cent. of tungsten is shown diagrammatically in Fig. 15. With the exception of the absence of chromium this material is typical of a high-speed steel. In this instance it will be observed that the Brinell hardness of the steel after hardening in an air blast from about 1,300 deg. C., is only 500, but that this value does not fall after the material has been heated to temperatures up to 500 deg. C. Further, by increasing the secondary heating to a little over 600 deg. C. a marked increase in the hardness takes place, and reaches a value

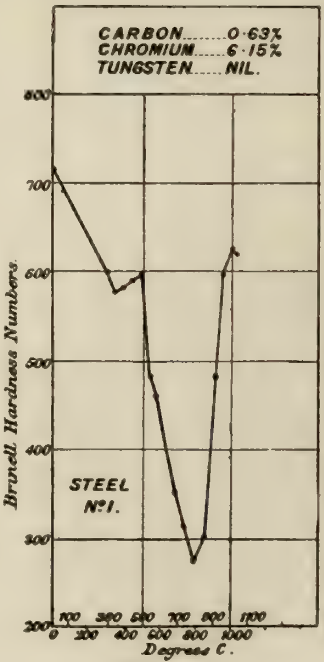


FIG. 14.

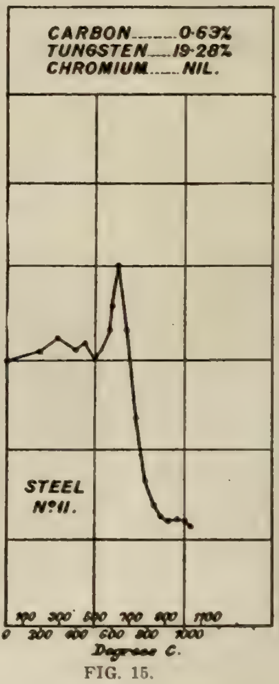


FIG. 15.

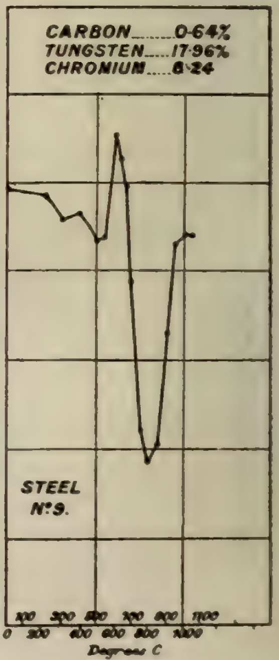


FIG. 16.

which is greater than it was when first hardened.

Tempering of Chromium Tungsten and High-Speed Cutting Steel

With steel containing 18 per cent. of tungsten, 6 per cent. of chromium and 0.63 per cent. of carbon, the effect of reheating properly hardened samples is shown in Fig. 16. Here it will be seen that the steel is very hard in the air-hardened state, and that the hardness falls rather markedly as the reheating is raised to 500 deg., but at 600 deg. C. a substantial secondary hardening sets in which makes the material much harder than it was in the initially air-hardened state.

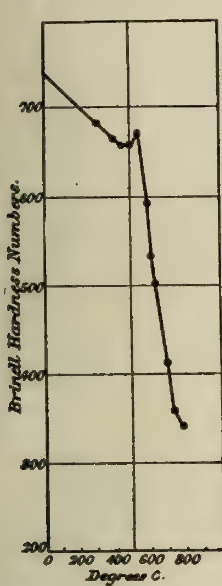


FIG. 18.

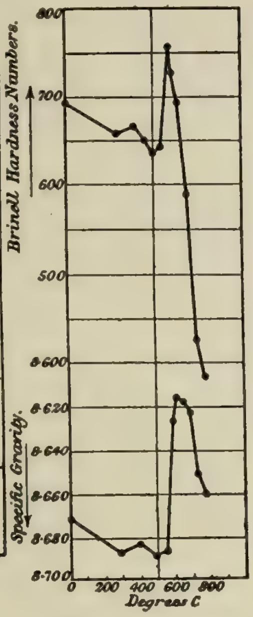


FIG. 17.

These facts are of considerable importance from the point of view of the machine shop, for they mean that high-speed tools should be treated in such a way that they possess this secondary hardness before they are put into use. This can be effected in one of two ways: (1) The tool may be air-hardened in the usual manner and then reheated to the necessary temperature, or (2) the same results can be obtained by hardening the tool by quenching, from the hardening temperature, in a bath of molten lead or suitable liquid which is kept at the correct temperature.

It has been suggested by some workers that this secondary treatment is not necessary in order to get the best cutting speeds out of a tool, and that the same results can be obtained by using the tool in the airhardened state and slowly increasing the cutting speed to the maximum. It is quite true that if this is done the frictional heat of the work done will indirectly subject the tool to the secondary heating, but in so doing it must be remembered that the tool becomes unduly worn as a result of its having unnecessarily to pass through a relatively soft condition.

Hardening Temperature

The temperature from which high-speed steels are hardened is perhaps the most important in the treatment of this class of steel. Broadly speaking, this should be practically as high as possible short of actually melting the metal. This is very clearly demonstrated in Fig. 17, which represents the influence of reheating samples of the same high-speed steel referred to above, that have been air-heated from 1.050 deg. C. In this instance it will be noted that the steel loses its hardness more quickly than if it had been hardened from, say, 1,250 deg. C., and further it does not show anything like the same degree of secondary hardening.

The difference in this respect is due entirely to the fact that the tungsten present in these steels does not completely go into solution until temperatures approaching 1,250 deg. C. are attained; and since it is to this element when in solution that we owe the property of secondary hardening and the power of retaining hardness at high temperatures, little or no return is obtained from that costly element unless the tool is heated to a high temperature prior to hardening. It should be stated that care must be taken not to heat the steel to such an extent that a partial melting occurs, for this leads to an embrittling of the tool.

Experiments have been made to determine the variations in the specific gravity of high-speed steel after being air-hardened and tempered at different temperatures. A series of these results are plotted in Fig. 18, along with the hardnesses. A change in the hardness is apparently always accompanied with a corresponding alteration in the volume. Thus, with each increase of hardness there is an increase of volume.

Photomicrograph No. 19 is typical of the structure of all chromium-tungsten cutting steels when in the annealed condition; No. 20 represents the normal structure of a properly hardened sample; whilst No. 21 shows what occurs if the steel is overheated, that is, partly melted in the hardening operation. The white irregular-shaped areas or constituent at the crystal boundaries in No. 21 are exexceedingly brittle, and impart very inferior cutting properties to a tool.

◆

CONSERVE OR PERISH

Whether we have a high tariff or no tariff, an income tax or a head tax, direct or indirect taxation, bimetalism or a single standard, national banks or state banks, are matters which concern, to be sure, the temporary convenience of the members of society, but their prejudicial adjustment is easily remediable; when ill effects become apparent, the inconveniences may be removed with but little harm to the community and none to mankind at large, or to the future. But whether fertile lands are turned into deserts, forests into waste places, brooks into torrents, rivers changed from means of power and intercourse into means of destruction and desolation—these are questions which concern the material existence itself of society, and since such changes become often irreversible, the damage irremiable, and at the same time the extent of available resources becomes smaller in proportion to population, their consideration is finally much more important than those other questions of the day... Only those nations who develop their national resources economically, and avoid the waste of that which they produce, can maintain their power or even secure the continuance of their separate existence.

◆

IRELAND has a number of ancient water power developments. Some of the corn mills have been uninterruptedly operated by water power since the seventh century, one of which is known as St. Fechin's in County Westmeath. Mills driven by water power were known in the fifth century.

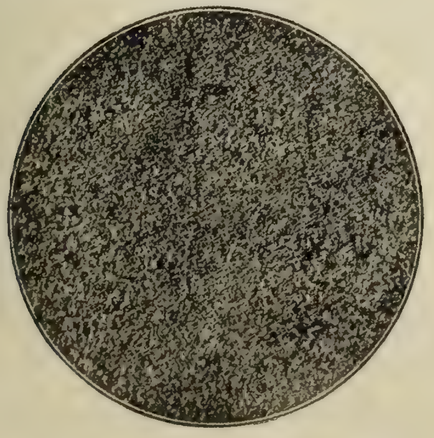


FIG. 19—ANNEALED HIGH SPEED STEEL.

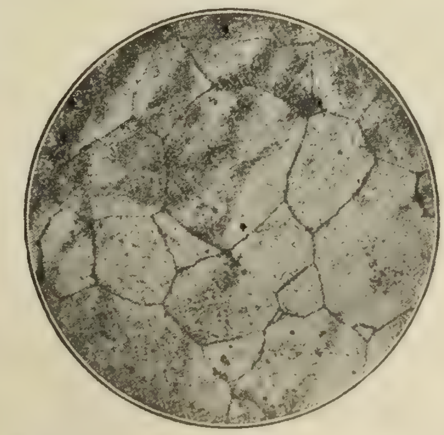


FIG. 20—HARDENED HIGH SPEED STEEL.

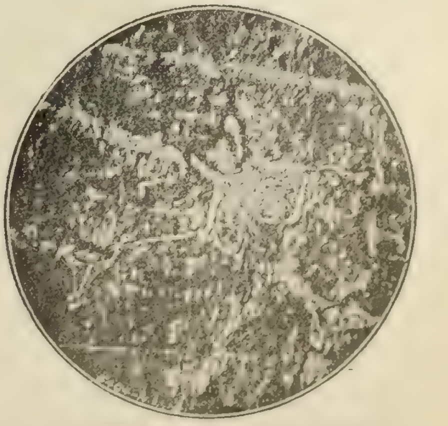


FIG. 21—HIGH SPEED STEEL HARDENED AT TOO HIGH TEMPERATURE.

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German Money a Real Boomerang.

THERE'S one man in United States who has broken all records for buying bonds. The way he tosses out millions for the Liberty Loan would make Carnegie or Rockefeller gasp and reach for the railing to keep from being swept off the deck.

His name is A. Mitchell Palmer. Already he has bought $60.000,000 worth, and he's still going strong. If you want to know how it's done, here's the explanation in Mr. Mitchell's own words:—

"Possibly I have some little right to be a Liberty bond salesman, if there is any merit in the maxim "practice what you preach," because they tell me I am the biggest buyer of Liberty bonds in America. I have got something like $60,000,000 worth, and it is a poor day when I don't subscribe for $1,000,000 more. For me it is a pleasant task because I buy Liberty bonds with the Kaiser's own money."

It so happens that Mitchell is Alien Property Custodian of United States. Here's how he operates.

"Why some few weeks ago, out in a western city, a school-teacher who was a German-born woman, died, and in her will she bequeathed $10,000 to von Hindenburg. I got that. I invested it in Liberty bonds and the proceeds were used to buy ammunition, and now Pershing's boys are trying to deliver the legacy to von Hindenburg over in Germany.

"We have made every dollar of German money in America fight the Germans. Great iron and steel mills, which were wont to send their profits out of America back to Germany, are now sending their profits to the Treasury of the United States and their product into war munitions to destroy their owners.

"Great woolen mills over in New Jersey, which were wont to send large dividends back to Berlin, are now sending those dividends to Washington, and working every loom and spindle to make those Army suits for the boys with Pershing in France.

"Great metal, mining, and mineral companies all over the United States, owned with German money, are working night and day, three shifts to the day, to produce material, not for the German over here to plant his industry in our midst as a sort of spy system against us, but for the United States, which he sought to destroy."

It is well to realize that war is not play. It's plain hell, and a nation must handle it in that way. Love taps don't fizz on the German either on the western front or in this country. Politicians are gradually coming to the stage where they know the German hasn't got a vote just now, and they're licked if they stop to reckon about the votes he may have in years to come.

One Grand Old Custom.

OH, things change fast in these here days, they're most peculiar times, and its hard to keep your ways and thoughts from draggin' on the lines. Why, things what was quite new and fresh a day or so ago is set kerchuck inside a day at the bottom of the row.

Why, clothes that wimmen used to wear, the latest thing in style, if we should see 'em nowadays we'd heave a husky smile.

Likewise the men they used to wear chin whiskers on their face, and sproutin' these here ornaments was like unto a race—but nowadays they whack them off and all our young man grows is a tuft about one inch across a-settin' 'neath his nose.

Folks used to get a paper 'bout once or twice a week, and through the columns of the thing both up and down they'd seek—they knew most all that paper said, they was full up with news, and likewise versed upon all stuff like Grit and Tory views. But in this here fast and dizzy age a sheet comes out at dawn, and 'fore the kettle's on at noon the thing is old and gone, and noon editions have a spell, they live for half an hour, but 'round at six they're greeted with a look what's cold and sour.

And youngsters used to learn to play pianers fine and grand, but now they pay their 30 cents for music rolls what's canned.

But there is one old custom, more glorious than the rest, that stays in favor in the north, likewise the east and west—when winter time comes 'round each year 'tis then it thrives for fair, when father slides down cellar and sifts the ashes there.—Ark.

IT'S a sort of mean trick to call it Spanish influenza, when no one has come forward to prove that it came from Spain.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Questions and Answers

Question.—In the September issue of CANADIAN FOUNDRYMAN you replied to my query relative to preventative measures in a case of polished steel rusting prior to plating. We have used the oil dip as you suggested and have experienced no trouble from rusting, but the plating staff claim they have great difficulty in cleaning the excess oil from the steel; it also entails considerable labor in the way of skimming. The cleaning tanks, water tanks and dipping crocks quickly become very badly coated with grease and oil above the solutions. As we are anxious to maintain first-class conditions in our plating room we will appreciate your further interest in our troubles.

Answer.—We are of the opinion that you have applied the oil too freely, or that the oil used is a heavy mineral oil. Possibly your cleaning solution is not suitable for the class of work you are treating, or it may be you do not maintain proper chemical strength in the solution. There are mild alkalis used for cleaning polished steel, which do not clean as effectively when used in excess of ¼ lb. per gallon of water. Such solutions require frequent small replenishments, and the bath must be employed at a temperature of at least 210 degrees Fahr. Do not use a heavy oil in the polishing department; a light vegetable or animal oil will saponify readily in a mild alkali, such as is generally employed by platers. The most logical and effective grade of oil to use is the kind known as soluble oil. There are several grades of soluble oils, some heavy, some light; either grade will mix with water and form the solution now so generally used in machine shop practice and known as "cutting compound." A soluble oil used on polished steel during the final polishing operations will entirely eliminate the troubles you experience with foul rims on tanks, crocks, etc. A hot solution of any good cleaning compound containing a small percentage of caustics will almost instantly remove the oil from the steel and 99 per cent. of the oil will saponify or emulsify and therefore enable you to keep a clean condition both as to solution and containers. By using an electric cleaner you may be able to transfer the steel directly from the cleaner to the hot copper solution you are installing, thus reducing the labor and upkeep cost of the department.

Question.—Please inform me of some chemical which will cause a zinc solution to plate bright. I have been told a colloid is used for this purpose. What is a colloid?

Answer.—Various substances are employed as brighteners in zinc solutions. These additional agents are used to prevent the formation of large crystals and facilitate the production of finer grained deposits. Almost invariably a colloid is found most effective. A colloid is defined by Webster as like glue or jelly, and in chemistry is applied to uncrystallizable liquids or those which diffuse through a given septum, as parchment paper, much more slowly than crystalloids, the latter being a class of crystalline bodies which have the power, when in solution, of passing through animal tissue. Colloids used in zinc solutions are, namely: gelatine, dextrine, alum, gum tragacanth, glue, powdered licorice, tannic acid and alum. The above are suitable where close grained, smooth, bright deposits are essential. When the prime requisite is a deposit of smooth matte possessing good adherent properties the following substances are used: molasses, alcohol, glucose, benzoic acid, sugar or pyrogallol. These are known as reducing agents and are used in proportions of from three to five per cent. of the solution. Nearly all patented formulas contain at least one of the above mentioned substances. Glue, alum, molasses and dextrine are the more popular ones among platers who prefer to prepare their own solutions.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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President—James Vallier, 701 Crawford St., Toronto.
Vice-President—Charles Kemish, 271 Boston Ave., Toronto.
Sec.-Treas.—E. Coles, P.O. Box 5, Coleman, Ontario.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, Second Thursday of each month, at 8 P.M.

Question.—In our plating department we operate a 400-gallon nickel solution. other point which has been proved on other occasions is that when a composition of 90 of copper and 10 of tin is cast in green sand it is never uniform. When large molten masses begin to solidify, an alloy poorer in tin than the mixture crystallizes first where the metal is chilled by contact with the mold, its composition being about 92 parts copper and 8 parts tin. The next portion solidifying The average load is plated with 350 amperes of electric current at a tension of 3½ volts. In the electric circuit we have a resistance coil which we understand has a safe carrying capacity of 370 amperes. Very frequently we find it necessary to load heavily enough to use 400 amperes. Each time we do this the resistance coil becomes extremely hot and radiates heat like an electric heating coil. Are we not wasting power? What would you advise us to do?

Answer.—You are not only wasting power; you are wasting time. By the simple application of Ohm's law you can ascertain your exact loss, which, when known, will no doubt surprise you. We would suggest the removal of the resistance coil from the electric circuit. If your average load requires 350 amperes and the carrying capacity of the coil is rated at 370 amperes, you will probably be able to increase the density of the nickel solution sufficiently to allow the unimpeded current to enter the tank and permit the average load to be increased, or the time of deposition decreased. Keep the ammeter connected in the circuit and use a cut-out when loading or unloading if the time required for these changes is sufficiently prolonged to endanger the deposits on a partial load. If a more concentrated solution does not give you the desired results with resistance coil removed from the circuit, place a lead coil just beneath the anodes at side of tank and heat the nickel solution to the proper temperature to ensure perfect deposits. By the latter method you will obtain the maximum output from your nickel solution with the minimum of waste time, power and labor, and the nickel deposit will be of superior quality. Use very low steam pressure in the lead coils to prevent difficulties arising from bursting coils. 5 pounds pressure is sufficient. Exhaust steam can be utilized to advantage for the purpose at a saving rather than an expense. Insulate the coil at points where it enters and leaves the solution to avoid leakage of current or continued loss of power.

Question.—Can you suggest a way to help us obtain increased production from our polishing wheels. The emery we are using is an artificial material recognized as a high grade abrasive, yet it does not adhere to the wheel satisfactorily. The glue employed is the best we can buy and is applied by the polishers as they require wheels set up.

Answer.—If you have enough work about the plant to warrant employing a man for laboring in polishing room, we advise training such a man to care for the polishing wheels as part time employment. We cannot advise the use of ground glue for dressing up polishing wheels. If the glue you are using is in large flakes or sheet form, subject it to the bending test. If a sheet of the glue will permit bending to nearly a cylindrical form before breaking and the fracture is smooth and clean, it is evidently a high grade glue. Break the glue into small pieces and soak in cold water for from 10 to 15 hours; dissolve the amount required for one day's use in a glue pot and carefully adjust the heat in order to prevent damage to glue by too high temperatures. Use a good stiff glue brush when applying the glue to the wheels. Wheels should be warm and quite dry. Rotate the wheels in dry warm emery contained in a shallow oblong wooden box, using moderate pressure during the operation. Place the wheels, when thus set up, in a closed box or drying chamber heated by steam coils. Heat for drying should be moderate, yet sufficient to thoroughly harden the glue before the wheels are again required. By following the above plan you should overcome your present difficulties and obtain greatly increased efficiency from the polishing wheels. In case you continue to have trouble from this source after trying the above method we would advise a change of abrasives. Polish wheel durability is quite often a question of abrasives rather than glue. All high grade abrasives are more or less subject to certain limitations respecting efficiency under varied conditions.

Question.—We will appreciate information relative to finishing slush mold castings of 13 parts antimony and 87 parts lead so as to produce a dead yellow. The finish desired was a popular gilt finish previous to the war.

Answer.—Cut the surface by either sand buff or tripoli. Flush in a warm cyanide copper bath, rinse and transfer to an acid copper bath where a one-hour deposit should be obtained. Rinse thoroughly, then immerse in clean boiling water, remove and allow to dry and become cool; then treat quickly in a slow acid, bright dip to produce a dead surface. The finish you desire is known as Ormula gold and it depends on the matte obtained on the copper deposit as to whether it finishes perfectly or not. After rinsing from the bright dip transfer the article to a bright brass solution to secure a yellow surface. Only a thin deposit is required. Rinse and place in a hot gilding bath for about ½ minute. Rinse well and dry by passing through a clean solution of neutral soap and water, followed by clean sawdust or soft cloth application. Burnish high lights carefully and apply transparent lacquer by means of spraying apparatus.

Question.—We have several gross of small yellow brass castings which we now wish to use on a new patented device. The color we desire, however, is of a red tone. We tried copper plate, but the color is not satisfactory. Can a red brass color be obtained on the castings by any simple method, or will we be obliged to remelt the yellow brass?

Answer.—You can obtain a reddish brass tone on the yellow brass by a simple pickling process. Procure a 5 or 10-gallon stoneware crock, one large enough to accommodate the quantity of castings you desire to treat at one time. In the crock place 3½ or 8 gallons of cold water and add 3 pints of commercial sulphuric acid to the lesser volume of water, or 3 quarts of same acid to the greater volume of water. Do not add the water to the acid. Pour the acid into the water slowly and stir the liquid while mixing. The operation is not dangerous if ordinary care is used. Immerse the castings in the solution and allow to remain until the color is a trifle more reddish than you actually require. The acid dissolves the zinc from the surface of the brass and a red color is obtained. The operation may require several hours' time, depending on nature of the metal. When the proper color is obtained, wash in cold water, pass through boiling water and dry in clean hardwood sawdust or by means of strong blast of compressed air.

Question.—I have constructed a mechanical plating device similar to those sold by the supply houses, and while the mechanical portion of the apparatus works splendidly I have had considerable difficulty with the solution. I use a rotating cylinder made of mahogany and bakelite. The driving mechanism is of cast steel, and the tank is of wood lined with asphaltum. The solution is double nickel salt solution containing boric acid, and the nickel deposits on both steel and brass goods is very dark. The solution is acid to litmus and registers 11 degrees Be. The deposits appear to be satisfactory, excepting color. What do you suggest as a remedy for the dark plate?

Answer.—Keep right on using the machine and brighten the darkened plate by a brief treatment in a wooden tumbler charged with dry sawdust. The discoloration is caused by the action of the acidulated solution upon the mahogany cylinder frame and will cease when the wood becomes thoroughly saturated. A neutral nickel solution does not cause this discoloration. The result is also more or less controlled by the speed of the cylinder and the size and shape of the pieces treated.

Question.—We desire to enlist the interest of your correspondent in our endeavors to select a tumbling machine suitable for quickly removing the scale from small steel bearings, which we wish to process in quantities of about 1,500 per lot. We have had no experience with devices of this kind and want to procure one which will be economical and efficient.

Answer.—The writer has supervised the operation of various types of tumbling devices during the past fifteen years and unhesitatingly advises the installation of an open tilting type tumbler for your purpose. Barrels of this type may be obtained with either wood or iron cylinder. For your purpose you will require a steel cylinder, one with ribs on the inside is most efficient. The vital points to consider in the selection of a machine of this type is the construction of the driving parts and the barrel proper. These should be heavy and built to wear. Some machines on the market are of smart appearance, but too light to withstand even ordinary usage for a reasonable period of time.

Question.—We have a number of large sheet iron panels to copper plate. The finish is required to be dull or after the fashion of a sand blast effect. The first shipment was quite satisfactory. The second has been returned to us because the surface is too smooth and bright in patches. The copper is adherent and pink. The solution shows 20 degrees Beaume and a curent at 2 volts tension is employed to operate the solution. How can we avoid the patches?

Answer.—As a first step we would reduce the density of the solution. Try the following: Transfer a small portion of the solution to a wooden bucket or stoneware crock and dilute with water until a density of about 13 or 15 degrees is obtained. Test the solution now by operating it with same current as used on large tank. If results are correct dilute the plating bath in same manner. If after several trials the mottled effect continues, add about ½ ounce of chemically pure sulphuric acid to each gallon of the solution. In the event of patches appearing after the above alteration to the bath, discard the portion taken for experiment and after rinsing the receptacle, procure a fresh quantity from the tank and dilute as stated; then add about 2 ounces of copper carbonate in plastic form to each gallon of the solution in the vessel and test as before with the current reduced to 1 or 1½ volts. Patches or mottled deposits, such as you describe, usually occur as a result of one of the above mentioned conditions, extreme concentration, low acid content, or extreme acidity, and may be corrected by carefully following the above advice. Do not discard the solution as unfit for further use. The efficiency of the bath has not been impaired permanently.

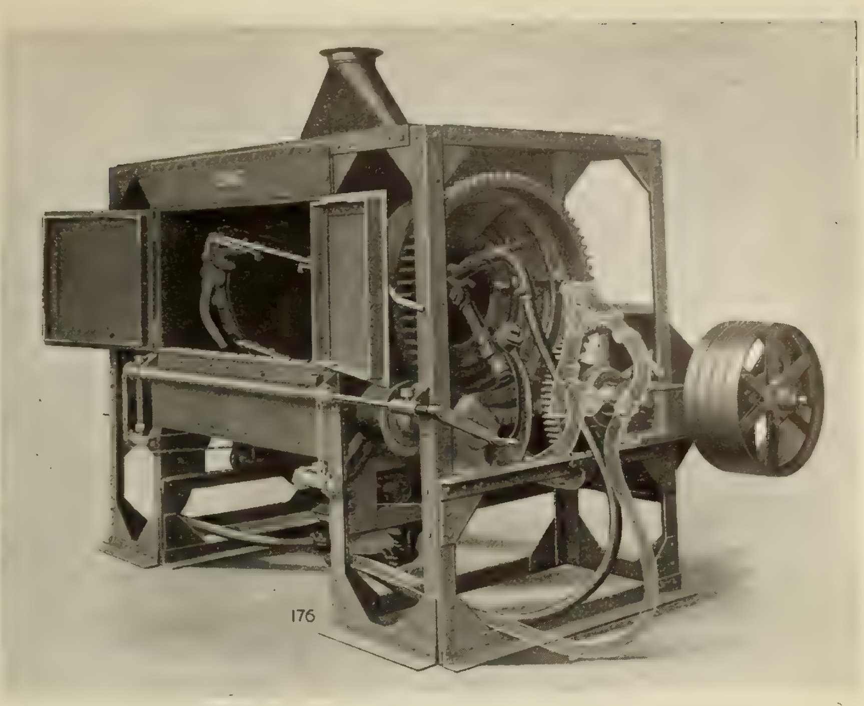
Question.—Kindly publish a formula for gilding castings of zinc alloy.

Answer.—Plate the alloy in a bright copper or brass solution, then gild in a solution composed of sodium cyanide, 6 penny-weights; sodium sulphate, 1½ ounces; sodium phosphate, 8 ounces; gold chloride, 6 penny-weights; water, 1 gallon. Dissolve the cyanide in ½ gallon of hot water, then dissolve gold chloride in same. Dissolve soda salts in remaining water and mix. Use at temperature of about 180 degrees Fahr., 2 volts tension. Brass is to be preferred as preliminary coating, as it requires less gold to produce satisfactory final color.

The average production of benzol per ton of coal is in the neighborhood of two and a half gallons. Seventeen and a half million tons of coal are at present being carbonized in this country in recovery ovens, and this should accordingly yield approximately 44 million gallons of benzol in the crude form.

HORIZONTAL SAND BLAST MILL

An interesting feature among the exhibits at the Milwaukee Foundrymen's Convention was that of the W. W. Sly Manufacturing Co., Cleveland, O., and which is illustrated below. This machine is known as the No. 30/40 sand blast mill, the barrel being 30 in. by 40 in. There are many new features embodied in the design of this machine, as for instance the motion of the barrel, which is both oscillating and rotating. The bearings are all of the roller type and are located outside of the housing so as to be completely protected from the action of the sand and dust. The sand blast guns are the Booster type, the efficiency of which is well known. The guns are mounted on brackets and can be adjusted to any desired position, and the bracket can also be thrown back as shown in the illustration. A very good feature of the barrel is the arrangement of the door, which is so constructed that it can be neither opened or closed until two levers on either end have been struck sharply. The position of these levers make it compulsory for the operator to have arms and head clear. The barrel door also locks automatically in the open or closed position. The door is made of ¾ inch steel plate and is strong and rigid. Care has been taken in the design to ensure ready access to all parts needing lubrication, inspection, and repairs.



SLY SAND BLAST DRILL

◆

OXYGEN AS IT AFFECTS THE FOUNDRY

By A. B. Wood

An expression frequently heard in connection with foundry parlance is the word "oxidize," or to say that certain material has been oxidized. For instance, if a casting becomes rusty or corroded either from moisture or from standing in the open air, it is said to have been oxidized. Or if a given amount of metal is charged into the cupola, and a lesser amount taken therefrom, the balance is presumed to have been oxidized. Or if the cupola daubing is cut away, or a scum forms on top of a ladle of clean metal it is traced to this same source. The question is, "What manner of process is this oxidizing, which attacks things which have been in contact with either fire or water, or even only the air?" It is simply having been exposed to the action of oxygen. Now what is oxygen?

Oxygen is an element existing in a free state in the air or atmosphere, and in a combined state in water. It forms about one-fifth of the weight of the air, and about eight-ninths of the weight of water. It is also present in the great majority of substances forming the earth's crust, and is the most abundant of all the elements. It is in reality the life of nearly everything which has life in it. Every living creature which breathes either air or water breathes oxygen, and it is oxygen which permits fire to burn. The oxygen contained in water will aid combustion if dis-associated from the hydrogen with which it is combined. Water will break up into its elements, hydrogen and oxygen, both in a free state. The oxygen thus released is in a very active state and readily combines with oxidizable substance present, such as iron. A flame may be either oxidizing or reducing, depending upon whether there is an excess or deficiency of oxygen in the flame. If the trough of the cupola is well dried the iron in passing over it will not affect it perceptibly, but if the trough is damp, slag will continue to form, so long as any moisture remains, a damp lining or daubing in the cupola will be affected in a similar manner, but to a greater extent. If the daubing is thoroughly dry before the blast is put on it will probably last through the heat, but if moisture will be more than is required to cause combustion and will attack the daubing and cause it to run in a thin slag, and float upon the melted iron. Similar results will be the effect of a damp lining in the ladle. If the ladle boils it will cause dross to form on top of the iron, which would not have occurred if the lining had been dry. In molding the same thing has to be guarded against. An overly swabbed gate, or too much water in the sand of which the mold is made, will cause the casting to be dirty, even though the mold does not scab. A green-sand mold will seldom produce as sound a casting as a dry mold, but if green-sand is to be used it should not contain any more moisture than is absolutely necessary. The effect of oxygen on the iron being melted in the cupola is also very marked. It is not possible to see what takes place in the cupola, but an idea can be formed by watching iron taken from the blacksmith's forge. A scale forms which falls off at the anvil. The fire in a forge and the amount of oxygen consumed is not to be compared to that of the cupola, but a very good idea can be formed of what the iron is being subjected to in being melted. Every particle of the surface exposed to the fire becomes oxidized. From this it will be seen that light scrap will have more surface in proportion to its weight, and will as a consequence show a greater loss. Iron, such as borings from the machine shop, being practically all surface, will be oxidized to such an extent that there will be little of anything but slag. This last item makes a good subject for study, as tons of good iron are wasted every year through borings being thrown away.

◆

LIFTING HEAVY PARTS FOR MACHINING

By D. S.

In a great many instances where heavy stuff has to be fixed in machines too much reliance is placed on manual labor, both strength and time being rather uselessly wasted in this kind of work. If a piece of metal or other material can be mechanically lifted and slung into position, say over a lathe there only remains the adjustment of position to be dealt with, and this is easier to manage with a slung article than with one supported by men's arms, let the men be as experienced and careful as they may. The methods of slinging will probably depend on the conveniences possessed by the machine shop, and will vary between overhead runways which will serve a long line of machines, to small portable cranes which move about on wheels, the matter being one of both cost and convenience. Whatever is used, however, it should be capable of holding the slung article in a convenient position for fixing, and in addition to the lift from the trolley or other carriage on which the article is brought up, should be clear of the machine itself, for very obvious reasons. A large saving can be made by using appliances of the kind with reduction of cost.

CASTING SOLID IRON OBJECTS IN PERMANENT MOULDS

The casting of iron in permanent iron moulds may be done for one of two purposes, either to "chill" the casting and induce hardness by preventing the carbon from entering the graphitic state, or to maintain soft machinable castings which can be produced in great numbers from the one mould. A chilled casting necessitates the use of cold chills—whether these form the entire mould or not—and the colder these are with suitable metal for the castings the deeper will be the chill up to the limit which the metal poured will permit. The machinable iron requires that the moulds shall be hot, and usually that the castings be thrown out while still red hot, no "chilling" of the casting being present, although the metal is denser and in material physical conditions different to that in castings made in sand.

According to the purpose for which the castings are used they may have either a rough or smooth skin, the skin following the surface of the mould. While assuming that clean metal is poured, clean, sound castings cannot fail to be produced, but, of course, where dirty metal is used the castings will not be clean. For castings to be left without machining, it is, therefore, necessary to have a mould cast with a smooth skin, but for those to be machined, the ordinary skin as given to castings generally will do for the mould. It is not desirable to machine the surface of the mould, as this will cause some amount of warping in time owning to release of the casting stresses, but if really necessary, some machining can be done, although in such cases both sides of the mould should have the skin removed to equalize the tension of the metal, all, of course, depending on shape and size.

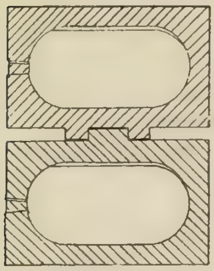


FIG. 1

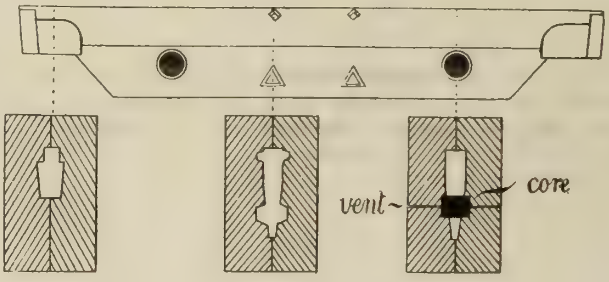


FIG. 2

The designing of the mould depends on the shape of the casting to be produced, not less than 2 in. of mould thickness being allowed in any part, but, subject to ordinary precautions, too much inequality of thickness should be avoided, the outside of the mould being very well reinforced by ribs where such are of advantage in providing additional strength to a more or less weak mould. Such details, however, can only be locally decided, as moulds vary in accordance with the castings produced, each mould having to be made suitable to the shape of the casting, but it may very well be taken that a heavy casting must have a thicker mould than a light one. The method of hinging or otherwise fastening the moulds together must entirely depend on the shape of the casting, because, while some permit of quite easy clearance with an ordinary hinge, others can only be cleared with a dead lift, as in the fire-bar presently shown, and obviously with a dead lift hinges cannot be used, some form of clamp being in that case necessary. In some cases merely rings to fit the outside of the mould will be necessary, while in others screw or other mechanically fastened clamps must be used; but in all cases it is desirable that simplicity and strength be the governing features, fine mechanical fittings not having any life in the rough wear and tear of the foundry, however much care is taken. A foundry cannot be other than a dirty place, although some are unnecessarily dirty, and for this reason provision has to be made for the prevailing conditions.

In casting solid objects, it must be borne in mind that the casting shrinks away from the mould, a bar 12 in. long needing a mould approximately 12 1-10 in. and in making the moulds provision has to be made for this, the moulds pattern being 12 2-10 in. long at the points coincident with the ends of the bar. The mould will shrink 1-10 in. to the 1ft., leaving the space for the casting 12 1-10 in. long, and the casting will again shrink 1-10 in., thus leaving it just 12 in. long when cold. This, of course, differs from the old sand moulding formula, but it will be found that shrinkages are rather different with permanent mould work; but, still, it will be found that actual shrinkage depends largely on the iron used, and will not follow that of hard chilled castings which are not machinable to any extent. The moulds being used hot, and the castings being thrown out hot, necessitates that provision be made for the handling of both, and here it may be pointed out that contraction takes place somewhere below 1,100 deg. Cent., and for this reason the castings should remain in the moulds until they are somewhere between 900 deg. and 1,000 deg. Cent., to permit of their separating easily; but if left too long in the mould they will heat it unduly, while to some extent they will harden externally. Castings should be placed on a bed of dry sand to cool, and in some cases should be covered to exclude air. Although probably metal cores would never be wanted in solid work, any small holes being produced by sand cores, yet it may be noted that metal cores can easily be removed between 1,100 deg. and 1,200 deg. Cent., as shrinkage has not then occurred.

With a plain solid casting as shown in Fig. 1 hinged moulds can be used, as there is nothing to catch the casting, but with such a thing as is shown by the firebar sketched in Fig. 2, a dead lift mould must be provided, as will be seen on reference to the sections shown. In the case of a pipe or similar round object, hinged moulds come in well, as the mould leaves the casting easily, a matter which has to be considered in designing the moulds. In cases where sand cores are used, as shown in the illustration, Fig. 2, recesses must be made in the mould to take the core ends, a small hole being drilled from each recess to permit of the exit of any gases

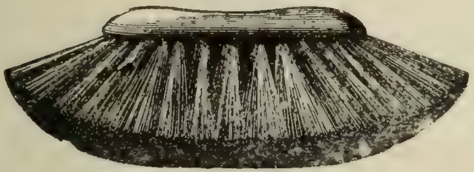
Unlike brass and some other alloys and metals, iron, if clean, does not produce gases which have to be removed by venting; but as the permanent iron moulds are, of course, impervious to air and gases, except to a minor extent, it is necessary to provide against the formation of pockets of air which will prevent the metal running up, vents having to be provided in such cases should they occur. No hard-and-fast rules can be laid down, however, the only point being that where vents are provided they must be efficient without causing trouble where the metal runs into them, and for this reason they should be in the joint of the mould when this is possible.

Chilled castings are produced by using iron chills as cold as possible in conjunction with chillable iron, it not being necessary that the chill form the whole mould. In this work the object aimed at is to set or congeal the iron before the carbon passes from the combined to the graphitic state, and to secure hardness for this reason. In permanent mould work the object aimed at is to produce soft, unchilled castings, that can be machined, and, so far as possible, nonchillable iron is used for the castings. The texture of the iron in castings made in iron moulds differs from that where sand moulds are used, but the metal machines readily and with a better face as a usual thing; this, of course, being dependent on clean metal being used and poured. Where there is any fear of porosity, large heads to the runners should be used, but there should be no necessity to have porous iron if suitable metal is chosen and if in cupola melting clean fuel is used.

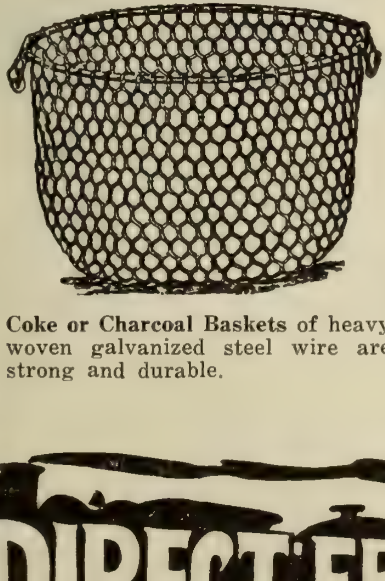
It does not pay to make permanent iron moulds unless long runs of work be needed, and the moulds must be kept at work each day from start to finish if any good is to be secured, from four to a dozen casts per hour being made, according to the character of the castings produced. The moulds can be stored for any length of time when not in use, but while in use they must be kept busy, and to get the best results there should be enough moulds at work to keep a special gang employed in operating them. This must always be considered, because to have one small mould poured two or three times daily only will prove a ghastly failure whoever tries it.

These Foundry Ladles are flat bottom riveted steel bowls with forged lips and vent holes.

Bench Rammers as illustrated are made from maple hardwood, thoroughly oiled, 13" long by 4½" diameter.



Moulders' Soft Brushes as above are made from the best quality pure Russian bristle, four inches in length, wire drawn. The block is in two pieces, glued and screwed together.



Coke or Charcoal Baskets of heavy woven galvanized steel wire are strong and durable.

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Used with unequalled success for General Machinery Castings. Put it to the test.

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Head Office and Mill - HAMILTON, ONTARIO

DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	30 00
Copper, electrolytic	30 00
Copper, casting	30 00
Lead	10 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	100 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$20 00
Copper, crucible	24 50	24 50
Copper, heavy	24 50	24 50
Copper wire	24 50	25 00
No. 1 machine composition	22 00	22 50
New brass cuttings	16 00	15 00
No. 1 brass turnings	15 00	18 00
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	22 00
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	20 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	35 00	33 00
Malleable scrap	21 00	20 00
Pipe, wrought	22 00	17 00
Car wheels, iron	38 00	30 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	30 00	20 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	8 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.
B

¼ in.	$14 35
5-16 in.	13 85
⅜ in.	13 50
7-16 in.	12 90
½ in.	13 20
9-16 in.	13 20
⅝ in.	12 90
⅞ in.	12 90
1 inch	12 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 55
Solder, guaranteed	0 60
Babbitt metals	18 to 70
Soldering coppers, lb.	0 64
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	....	10 70
Premier, 10¾ oz.	....	11 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$13 00
3-16 in.	12 50
¼ in.	11 75
5-16 in.	11 40
⅜ in.	11 00
7-16 in.	10 60
½ in.	10 40
⅝ in.	10 00
¾ in.	9 90

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%; headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.58 to	$0.65
Copper	.36 to	.46
Tin	.70 to	.70
Silver, per oz.	1.05 to	1.00
Zinc	.23 to	.25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, hydrofluoric	.14½
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.22
Ammonium, carbonate	.33
Ammonium, chloride	.40
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.15
Caustic soda	.17
Copper, carbonate, anhy	.75
Arsenic, white	.27
Copper, sulphate	.22
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel sulphate	.35
Potassium carbonate	1.80
Silver nitrate ....(per oz.)	1.15
Sodium bisulphite	.30
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.50
Sodium cyanide, 98-100%	.38
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.85
Zinc chloride	.90
Zinc sulphate	.20

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1.35
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.		$3 25
Polishing wheels, bullneck		2 00
Pumice, ground		07
Emery composition	10 to	6- 9
Tripoli composition	06 to	9-10
Rouge, powder	.30 to	.35
Rouge, silver	.50 to	.55
Crocus composition	08 to	8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 34
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 43

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

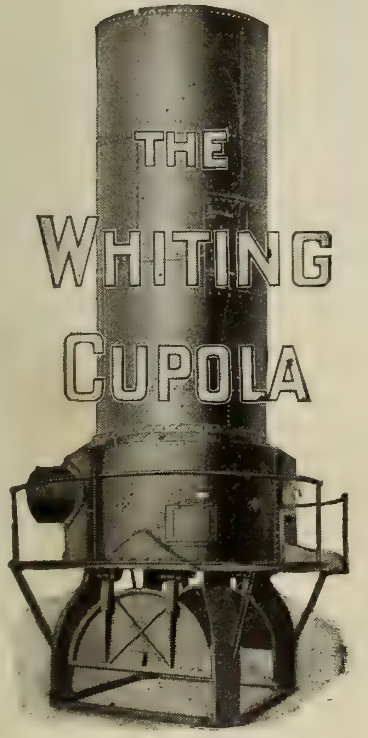
General Market Conditions and Tendencies

TORONTO.—Munition shops in Toronto started work on Tuesday morning as though there had been no cessation of war. Of course the management and those in the works know very well that it will be only a short time until these operations shall have ceased. There does not seem to be any tendency to adopt the guillotine method in cancelling these contracts, rather does it seem likely that they will be dropped as easily as possible, with a view to avoiding anything approaching a panicky feeling in the industrial or labor world. It is intimated that the policy of United States authorities will be to pay for all material in the process of manufacture, and to make readjustment on the basis of labor costs on material that is not needed. It is likely that the same treatment will be extended to shops in Canada handling American orders. It may be that before this reaches the readers a statement may have been sent out from Ottawa covering the case in full.

Dealers in Canada are not quite clear yet on some of the rulings that have been made at Washington regarding the placing of stock orders with firms on the

We are prepared to supply Cranes of all descriptions.
Write us if interested.

Cupolas



The Cupola with the reputation. Prices and data gladly supplied.

Ladles

All sizes and kinds handled by us

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If you require and want the latest let us send you printed matter at once.

We also handle all other Foundry equipment manufactured by Whiting Foundry Equipment Company, of Harvey, Ill.

The Dominion Foundry Supply Co., Limited

(Everything for the Foundry)

TORONTO **MONTREAL**

If any advertisement interests you, tear it out now and place with letters to be answered.

other side of the line. The interpretation of the order made at Ottawa docs not coincide with that at Washington in detail. In fact in a good many cases there has been quite a bit of confusion regarding priorities and licenses. Some of the larger dealers have found it necessary to institute and maintain a separate department to deal with these matters.

One of the dealers here expressed the view this morning that the day of the single-purpose machine had not passed with the end of the war contracts. "I believe that production machines in specialty work will be more than ever used in this country, and that to that extent they will replace the general purpose machine. The best results have been obtained where each operation in the shop is specialized."

This same dealer refused absolutely to believe any blue-ruin talk. On his desk were letters from four firms that had not in four years purchased a dollar's worth of equipment outside of war work machinery. They stated that they were desirous of information regarding certain lines of machinery that the dealer had practically gone out of for the period of the war.

The Supply Departments

Supplies for war shops will be the last to receive notice to quit. As long as there is a shell made it will be necessary to have supplies for the work. Some of the dealers here are fairly well stocked with this material. They are getting rid of it in fair style, however, and by the time the munition contracts are done for they will be pretty well squared away on the material that they had to purchase at war prices. War shops have been buying their supplies rather close for some weeks past so that there will not be any particular jar in this direction.

The Steel Stock

Most of the houses doing a warehouse business in steel are in good shape. That is they are fairly well cleaned out of material that has had a period of very high and inflated value during the period of war buying. In some cases, however, there are stocks held that will not be readily disposed of at prices that will clear the dealers. For instance, some places have a fairly large amount of nickel steel on hand. When munitions contracts and airplane building fall off the big demand for this in war work will be done for. It is used for automobile axles, but builders of cars are not likely to pay war prices for anything that will be sold in the after-war market. This opinion is simply based on presumption.

Dealers do not look for a slump in the price of the basic article, steel. They anticipate a higher level than is paid at U. S. points of production now.

There seemed to be a tendency all through the market to look for good business ahead. The trade is willing to admit that there may be a period of quiet trade, but the fact that the war is over and the Allies are more than conquerors is enough to counterbalance this many times over.

Full Up On Scrap

"For the greater part of last week," stated one of the big dealers, "we were out of the market entirely. We are not keen to buy now. In fact there are lines that we would not purchase at any figure. Our whole premises are loaded to the ceiling, and we will not take on anything else. The whole trend of events and of feeling in the trade points to lower values, although the prices quoted now are nominally correct. The situation is this," he continued, "prices are now too high for commercial business. They are, on an average 85 per cent. above the pre-war figures, and we are not going to buy at war prices and hold to sell into a lower after-war market. Copper and spelter set the pace for the yellows, so brass follows. Copper, as a general thing, is the big end of the scrap metal business, although according to the stocks at the foundries, steel and iron are a close second at times. The average price of copper before the war was around 14 cents per pound, while the price fixed by the United States government at the present time is 26 cents. There are large quantities of scrap offering for sale. We don't want to buy and we may as well make our position definite in the matter."

TRADE GOSSIP

Steel Plant Busy.—The electric furnace of the steel works at Port Moody, B.C., is in full blast and turning out pig iron in quantities. Big shipments of this are being despatched to Japan.

American Subscriptions. — We have been advised through Mr. J. Gilbride, manager of the Spartan Machine Company, that the following subscriptions to the Victory Loan have been received from American firms. The Geometric Tool Company of New Haven, Conn., $2,000; the Murchey Machine and Tool Company, of Detroit, Michigan, $1,000; the Superior Corundum Wheel Company, of Waltham, Mass.

George Lockhart Schuthe, manager of the Vancouver branch of Messrs. Darwin & Milner, Ltd., steel manufacturers, Sheffield, England, is leaving Vancouver to undergo special training at his firm's mills in Sheffield on their new patented cobalt-chrome steel, prior to his returning to New York to "coach" the mills in Pennsylvania, in which his firm is interested in the production of the same material for the United States.

Business changes.—The Coleman Fare Box Company, Ltd., of 1191 Bathurst street, Toronto, have just completed the purchase of the patent rights, assets, stock in trade, patterns, etc. of the Doust Specialty Company, Ltd., 77 York street, Toronto. The former company will continue the manufacture of the J. D. lawn rake, the Doust self-winding clothes line reel, the Dreadnought line grip in its various sizes, also rink scrapers and snow shovels. F. Tissington, A.S.M.E., is the manager of the first-named company.

This Firm to be Congratulated. To have thirty-two out of a staff of thirty-five as subscribers to the Victory Loan is a record of which the Volta Manufacturing Co., of Welland, may with reason be proud. This is an even better record than appears at first sight, for the remaining three are apprentices whose bonds will likely be taken care of by their parents. The average per capita subscription was $300, and the total amount subscribed was over $9,000. This amount brought the percentage up to 244 of the amount assessed.

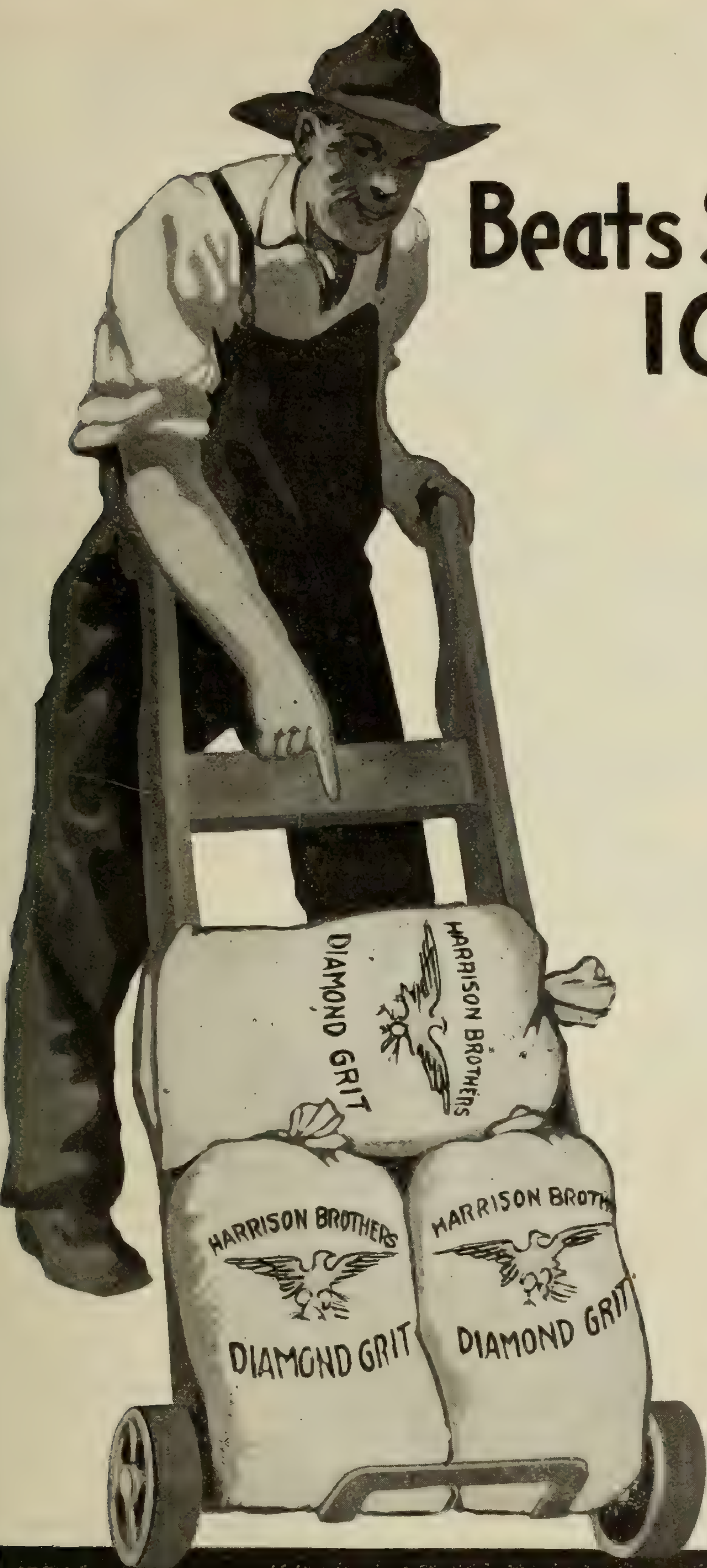
More Trouble.—At a meeting of representatives of unions among the employees of the Dominion Iron and Steel Company, the Dominion Coal Company, and the Nova Scotia Steel and Coal Company, it has been decided to bring on a general strike at the Cape Breton steel plants and coal mines unless J. A. Nicholson, president of the recently organized clerks' union is reinstated in his position on the clerical staff of the Dominion Iron and Steel Co. If the strike decision is persisted in, both steel plants as well as all the island colleries of both the Dominion and Scotia companies will be completely tied up. A telegram has been sent to Ottawa by the Sydney Trades and Labor Council notifying the government of the proposed strike.

Canadian Patents.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge street, Toronto, from whom further particulars may be obtained: Teofron Boberg, methods of making sodium ferro-cyanide; The Williams, Green & Rome Co., Limited, reversible soft collars; Harry G. Roberts, collars; Lewis Lewison, apparatus for the manufacture of ice cream cones; Patrick Masterson, punching machine for hollow tubes; Wasson Piston Ring Co., methods and machines for producing end clearance of piston rings; Sylvester J. Moore, gas meter; Wm. C. Brown, pneumatic straw stacker; G. W. Houghton, leather bags or cases; John Miles, gear generating and hobbing attachments for universal milling machines; Sanderson McMillan, flour mill machines; D. M. Patrick, anti-creeping devices for railway tracks.

LINING ROUGH EMERGENCY CRUCIBLE FURNACES

By M. M.

Given an old sheet iron oil or paint drum, about 20-inch. diameter by 30-inch. deep some means of producing blast, if only from a portable forge, a 30-lb. or 40-lb. crucible, and some coke of anthracite, if you line the drum with some fairly refractory material, you can melt anything up to copper. Sandy brick earth, clay, sandy silt from the riverside, scraping off a stoned road—not limestone — and other earths will answer fairly well for a few melts, if dried before firing takes place, and make passably good makeshifts for good linings, but of course, a fire-clay that will burn hard or a good ganister is best, owing to its greater durability. With a little ingenuity, however, emergency melting can be done readily if a little thought is given to the matter.



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Grinding; Its Utility in the Modern Shop

Grinding Has Become an Operation of Great Utility and Successfully Replaces the Lathe in Many Lines of Manufacture

By D. STREET

DESPITE the recent great extension of grinding as a machine shop operation erroneous ideas as to the sphere of action of the grinding machine and as to the principles and practice of the grinding processes are still prevalent. It is still widely believed that grinding is only necessary or advantageous when hardened work has to be dealt with, that it is essentially a slow process, that its scope does not extend much beyond the giving of a final polish to an already rough tooled surface, and that any way it is not of much use for general work, as distinct repetition manufacture. These ideas, among others, were effectively dealt with by Mr. H. H. Ashbridge in an excellent paper on "Workshop Precision Grinding," read before the Manchester Association of Engineers recently. At bottom they are founded on a belief that grinding is in essence a rubbing or polishing process. That, of course, is incorrect. Whether the materials to be ground are in hardened or soft state, or whether forged or cast, grinding is just as surely a cutting operation as using a lathe or planer tool. Just as the tool has one cutting edge, and will remove a chip proportional to its strength, so the grinding wheel has multiple cutting edges and the chips removed by each cutting edge bear a striking resemblance, when examined under microscope, to those produced by the lathe tool. It is not claimed for the grinding wheel that it can compete with the lathe or other machine tools as a metal removing machine, as measured by bulk of metal removed, but in any metal-removing operations that include finishing, a point is reached when the grinding machine in some form or other will remove metal faster than the cutting tool of the machine. No universal rule can be given for readily determining the point at which the advantage passes from tooling to grinding; it must be judged from each piece of work separately. Some typical examples are, however, on record. In the course of tests carried out by Mr. Dempster Smith at the Manchester School of Technology, it was found for example that the best attainable time for a finishing cut of 0.003 inches, with a lathe on an 8-inch shaft, was 7¼ minutes per foot, while a grinding machine would remove the same cut in 1½ minutes per foot. These times are for grinding and tooling to approximate size. For the whole work of removing the same cut, and also sizing to within .005 inch limits the grinding machine would require only four minutes; what the lathe would require over and above 7¼ minutes for sizing, filing, and polishing is not stated. Experience goes to show that the last thin skin of metal up to .015-in., .02-in. thick can be removed quicker in the grinding machine than any other method of machining, while if the amount of metal left on for machining is not very great, the grinder can do the whole job, roughing and finishing, very much quicker than the lathe. From an 8-in. shaft a cut of 1-32-in. can be removed by grinding at the rate of four or five minutes per foot length. Against the common belief that the grinding machine is one used for mixed work the grinding machine shows to advantage on repetition work, owing to its arrangement for accurate feed and automatic trip when the article being ground has been reduced to its predetermined size; these same features also make the machine advantageous on single articles, as after taking a few trial cuts, the work is measured for the amount oversize, and the micrometer feed set to take off the remainder, which can be done with great exactness. One important point rightly emphasized is that while the operator may by skill counteract the faults of a defective lathe, the grinding operator has no such recourse; hence grinding machines must be correctly designed well made and properly maintained. Moreover, the lathe operator can get moderately good results within wide range of speeds, feeds, and tool shapes, but in grinding the conditions of efficiency are much more narrowly circumscribed, and the operator must follow closely the directions, or the result will be not merely diminished efficiency but failure. The qualities essential to good grinding machines are truth and rigidity. The necessity for a high degree of truth will be seen from a moment's consideration of the fact that, while most machining operations are of a primary character, the ultimate finishing being done by other means, such as the file or a scraper, a grinding machine or a finishing machine, in which the work produced needs no further correction. For this reason, it follows that the sliding surfaces of the grinding machine should be as nearly as possible true planes. otherwise accuracy of product is impossible, and the object in view isolated. The limits of error allowed in building grinding machines are "none," but certainly the highest degree of accuracy is essential. Rigidity is no less important, and especially rigidity in the grinding wheel head, which must be heavy enough to carry the largest and the broadest wheel with which the machine may possibly be fitted, and also to overcome any possible want of balance in the wheel itself, while the spindles and its bearings should be of similarly ample proportions. It is for this reason that the grinding machine cannot very well be improvised. Many attempts have been made to convert the lathe into a grinding machine by means of attachments, but such attempts can only meet with very moderate results, owing to the lack of the necessary rigidity. Yet another essential quality in a grinding machine is ample driving power, in order that the whole may not slow down during momentary heavy cutting. Not only is the wheel wasted by being allowed to slow down, but what is more important, the wheel face is destroyed, and more frequent truing up is necessary. Many a potential user of the grinding machine has been put off by the thought of the number of fairly expensive grinding wheels of various widths and grades that must be kept on hand for the different kinds of work. For plain external grinding it is very unusual in general machine work to require more than two wheels to a machine, one to grind all classes of steel work with, and the other to deal with all cast metals. Closer grading can be done where the work is all of one class, but for general mixed work a couple of wheels can be arranged to efficiently cover the range. This has only been made possible by quite recent improvements in wheel manufacture. Perhaps the most striking item is concerned with wheel width and table travel. The two must be considered in conjunction. It is of very little use to have a wide wheel in combination with a slow table traverse. The only result of such a precedure would be a limitation of the production of the machine, and excessive wear on the portion of the wheel used, causing the machine to generate a round face, and making frequent truings necessary in order to cut away the unused portion of the wheel. The question is often raised whether the wheel keeps flat when grinding work with shoulders. If the traverse of the work per revolution is less than half the width of the wheel, then the cutting face of the latter will gradually wear convex, but if the traversemper revolution of the work is over half the width of the wheel, then the wheel will preserve a flat face. The ideal traverse per revolution of the work is about two-thirds the width of the wheel, but it should not, except for finishing. be less than half the width. It is for this reason that the grinding machines are now being built with table speeds of 16 feet per minute over, in combination with wide grinding wheels. The main factor governing production on external cylindrical machines is the combination of wide wheels with fast table speeds, as, other things being equal, the machine which possesses these advantages is the most efficient tool. Work speed is the least important of all the factors mentioned above that if it is too slow it limits the rate of the table travel, and so limits the rate of output. Work speed is mainly governed by the speed of table traverse in conjunction with the wheel width. The practice advocated for external cylindrical grinding is to work on an average surface speed of 60 feet per minute as a basis. This practice is claimed to be based on experience and a close observation of grinding in its various phases. As to the relative advantages of grinding or tooling for this or that work, there may be wide differences of opinion, but few will disagree that whether a machine-shop is engaged on high or low grade work the grinding machine can be made a very important producing factor in any shop system, and once a works has got the grinding habit, the making of a single article of manufacturing in quantities becomes easier of attainment when compared with a works without the grinding habit.

◆

PRESERVATIVE COATINGS FOR IRON AND STEEL

By M. E.

For preserving iron and steel it is the primary coat which is of the utmost importance, the succeeding coats being less so, while the final coat may consist of any good oil paint tinted as may be desired. When the three coats are to be applied it is recommended that the second coat should consist of equal parts of the priming coat and of the finishing coat, the difference in color between it and the priming coat then being sufficient to show when every part of the surface has been covered. Red lead has been used for a number of years as the pigment for the priming coat. It belongs to the class of pigments known as inhibitors. Attention, however, is drawn to a series of tests on steel plates conducted at Atlantic City by the American Society for Testing Materials; the results of these tests being sufficiently interesting to quote here:

AVERAGE RATINGS OF PAINT TESTS.

No.	Pigment.	1910.	1911.	1912.	1913.	1914.
9	Orange Mineral	9.0	8.3	6.9	4.0	3.0
10	Red Lead	8.7	8.3	8.1	6.3	4.0
16	Natural Graphite	9.1	6.8	6.6	6.2	4.0
17	Artificial Graphite	7.1	5.9	5.9	2.6	0.0
34	American Vermil.	9.1	10.0	10.0	9.8	7.5
36	Medium Chrome Yellow	7.0	7.7	7.7	5.2	3.5
39	Zinc Chromate	9.4	9.5	9.5	8.0	4.0
41	Chrome Green	9.8	9.8	9.8	7.6	5.0
	Chromate	9.5	9.7	9.7	8.3	4.0

The figures represent the condition of the coated plates after exposure as compared with the original condition, which is rated at 10. It will be observed from these tests that the pigments showing the greatest inhibiting power are chromates, and especially the basic chromate of lead known as American vermilion. The high cost of this pigment has so far militated against its more general use, but, it has better covering qualities than red lead, and, moreover, it has only about half the weight of the latter pigment, so that it yields a larger volume of paint. It is also much less prone to settle out in the paint can than is red lead. It is stated that a very satisfactory paint can be made with 75 per cent. of pigment and 25 per cent. of an inert filler, such as asbestine mixed with a vehicle consisting of 90 per cent. of pure linseed oil, and 10 per cent. of thinner and drier, the mixture weighing about 12½ lbs. to the gallon.

◆

Geo. F. Sheppard has joined the sales staff of the Canadian SKF Company, Ltd., Toronto, and will be in charge of the Montreal office, 128 Coristine Building. He will handle the SKF and Hess-Bright ball bearings, and also the products of the Atlas Ball Company. Mr. Sheppard has had a wide experience in the engineering field and was recently power sales engineer for the Northern Electric Company, Montreal, while for some time previously he represented the Canadian Hoskins Company, of Walkerville, Ont., in Montreal.

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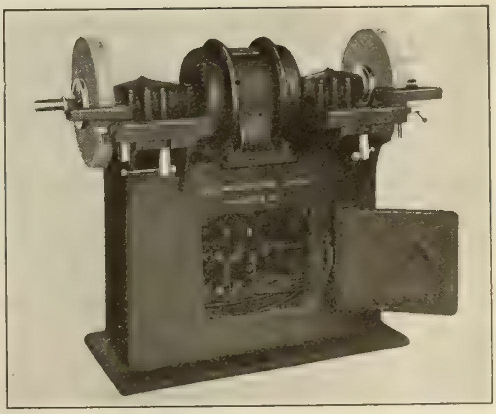

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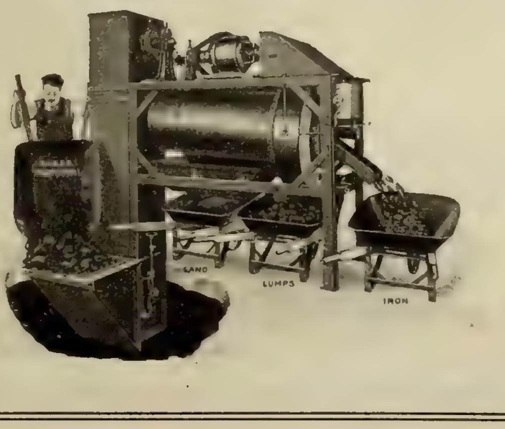

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And then the searchlight of this leading article is brought to bear on critically interesting situations in the Industrial and Business life of Canada to-day, situations upon which as a Canadian business man you will like to be quickly and clearly informed so that with other business men of your community you can share in the work that is going to make Canada a winner in world business as well as world warfare, and prosperous accordingly. Note what a mine of necessary information for this work you secure in this great number of THE POST:

FEATURES OF THIS INDUSTRIAL AND RECONSTRUCTION NUMBER OF THE POST

THE MANUFACTURERS' PART IN NATIONAL PROSPERITY—W. J. Bulman, president Canadian Manufacturers' Association; **SELL FINISHED PRODUCTS INSTEAD OF RAW MATERIALS**—Sir John Willison, president Canadian Reconstruction Association; **WORLD CHANGES—Economical Developments in Great Upheaval**—Prof. James Mavor, Ph.D., Department of Political Economy Toronto University; **EAST AND WEST—Setting the Stage for Amicable Meeting**—S. R. Parsons, past president Canadian Manufacturers' Association; **PEACE TERMS—Leading Nations Prepare for Aggressive Efforts**—Frank A. Sisson, vice-president Guaranty Trust Co. of New York; **EMPLOYMENT MANAGER—New Factor in Industrial Relations**—Edward D. Jones, Employment Management Section, U.S. War Industries; **LABOUR—Shortage of Man Power the Prime Factor**—James G. Merrick, Secretary Toronto Employers' Association; **U.S. RELATIONS—Brothers in Arms Likely to be Friends in Finance**—J. Herbert Hodgins, Statistican, New York Agency Union Bank of Canada; **PAPER EXPORTS—Looking to the Future of a Big Basic Industry**—F. J. Campbell, president Canadian Pulp and Paper Association; **TRADE BANKING—Who Will Supply Credit for Export Business?**—T. M. Fraser; **PRICES—Regulating the Law of Supply and Demand**—M. Mackintosh, Department of Labor; **CONSTRUCTION—Housing and Other Problems After the War**—J. P. Anglin, B.Sc., pres. Montreal Builders' Exchange; **LUMBERING—A Big Item on the American War Program**—An authority in the Canadian lumber industry; **FUEL—The Vital Factors of the Coal Shortage in Canada**—Charles W. Peterson, Deputy Fuel Controller for Canada; **SHIPBUILDING—A War-time Industry and Its Peace-time Future**—T. H. Fenner, Associate Editor Marine Engineering; **AUTOMOBILES—Interesting Stage of Great Industry's Growth**—W. A. Craick, Associate Editor The Financial Post—**STEEL—Efficiency the Dominating Factor in the Readjusting Process**—A. R. Kennedy, Editor Canadian Machinery; **MILLING—Filling European Bread Basket**—H. H. Black, Associate Editor The Financial Post; **AFTER THE WAR—We Must Be Ready**—Col. Thos. Cantley, chairman Nova Scotia Steel & Coal Co.,

Authoritative Opinions on the Future of Canadian Industry are expressed by late Senator Henry W. Richardson of Kingston; J. Frater Taylor, president Lake Superior Corporation; A. O. Dawson, vice-president and managing director Canadian Cottons; Carl Riordon, vice-president and manager, Riordon Pulp and Paper Co.; and others.

Other subjects dealt with include Women Workers in Industry; Development of Foreign Markets, Etc.; while the Sugar, Textile, Paint, Packing, Musical Instrument, Furniture, Pulp and Paper, and other trades are reviewed.

A copy of this splendid issue (which runs to 56 pages) will be sent you free, while the edition lasts, but a better way to secure a copy would be to order your subscription now for THE FINANCIAL POST. This will ensure your receiving a copy of the Industrial Number free, and THE POST regularly for a year besides. There never was a more vital year for Canadian business. POST service in important and exclusive business information **that can be used to good purpose and profit** will prove worth many times the subscription price of $3.00 per year. You will find it convenient to use the following form in ordering subscription:

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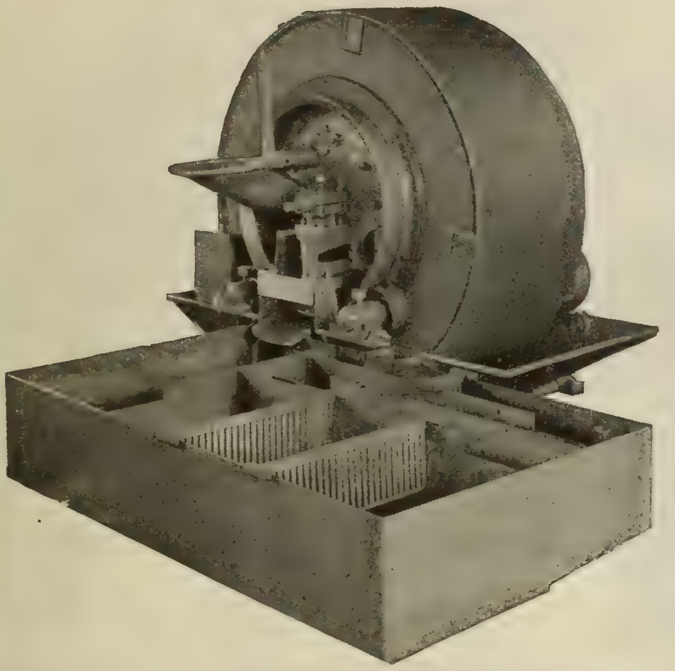

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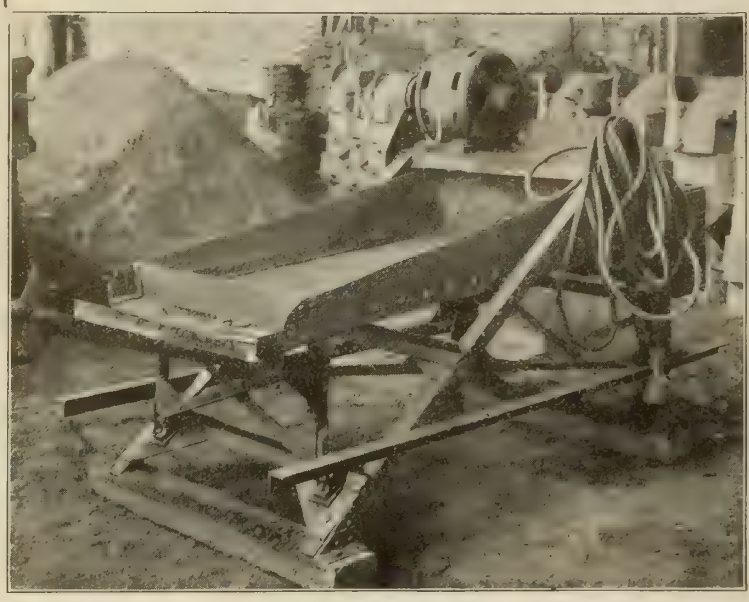

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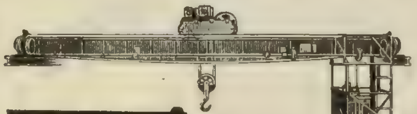

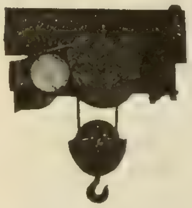

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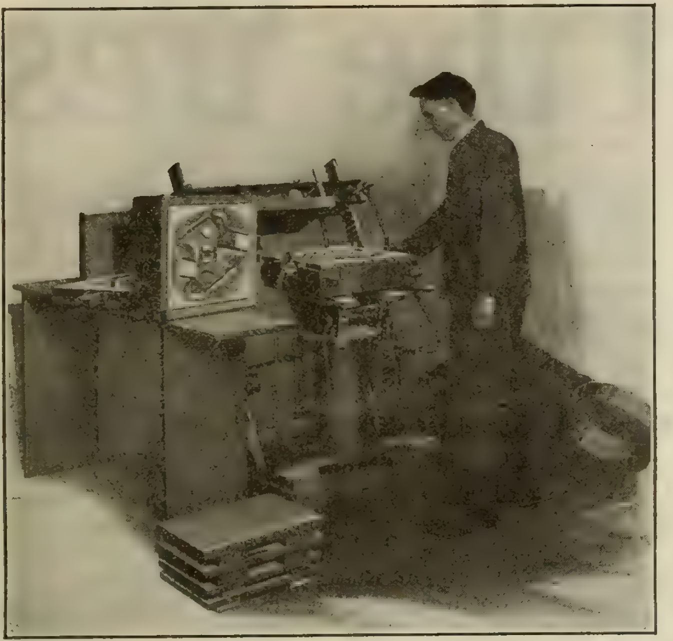

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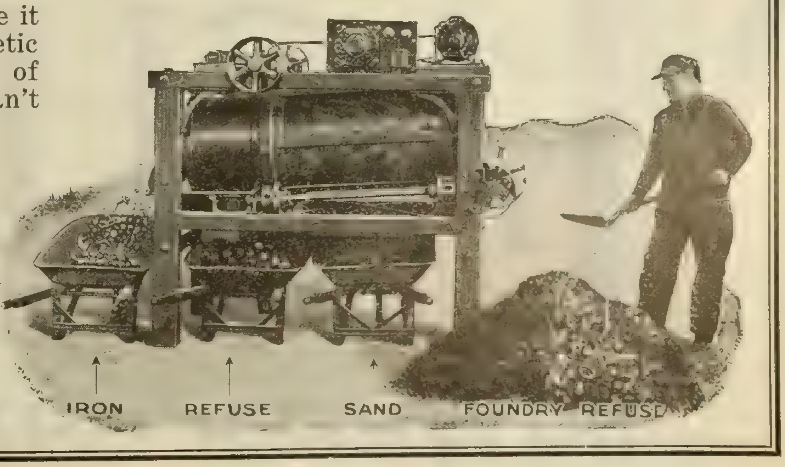

"The Power of the West"

As soon as peace is in sight, politics will again come into play in Canada and then the West may hold the balance of power. Such is the prediction made by J. K. Munro, special political writer, in November MACLEAN'S. He thinks that the Western tail may wag the Canadian dog and that this explains why statesmen and others are trying to-day to get both hands on the tail. An outspoken article—incisive, humorous, fearless, unbiased. Read it—"The Power of the West."

Germany Should Pay Canada's War Debt

Had Germany won the Junkers intended to seize and divide Canada. Writing in the November issue of MACLEAN'S MAGAZINE, Lieut-Col. J. B. Maclean contends that the war debt we have piled up should be paid in cash by Germany as one of the peace terms. He makes a vigorous presentation of Canada's case.

Chronicles of the Klondyke

The real story of the great gold boom is being told for the first time by E. Ward Smith, who was treasurer, assessor, clerk and tax collector of Dawson City during the Yukon stampede. His series starts with "My Recollections of Early Strikes"—Strange stories of how men stumbled on tremendous fortunes in the frozen North. The author knew everyone in the Klondyke and saw everything that went on at first hand.

Bright Stories—Vital Articles—Famous Writers

The important articles and the big stories that are being written in Canada by the best Canadian writers are always found nowadays in MACLEAN'S. Here's a partial list of the November bill:—

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World Happenings in a Nutshell.—"Review of Reviews Dept."

The periodicals of the world are searched to get the best articles on current events. For instance, November MACLEAN'S contains: The Starving of Lille, The True Story of the Jameson Raid, Germany's Fleet Will Come Out? Mysterious New City in France, The Woman Who Caused Russia's Defeat, Hypnotism Cures Shell Shock, How Turkey Planned to Butcher British, Queen Mary is Accomplished Letter Writer, Why Palestine Was Captured.

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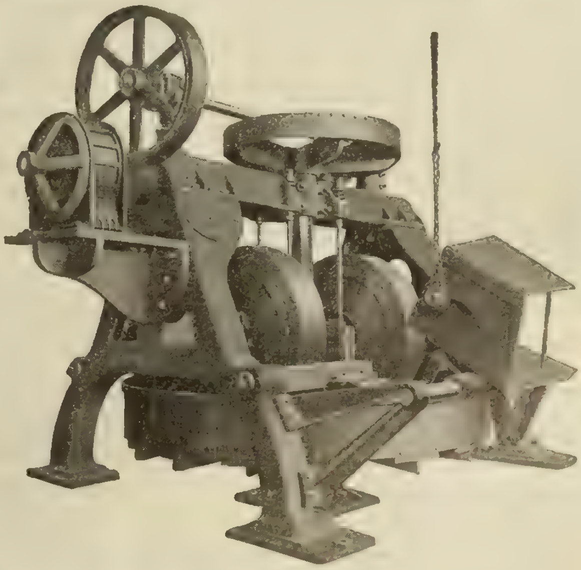

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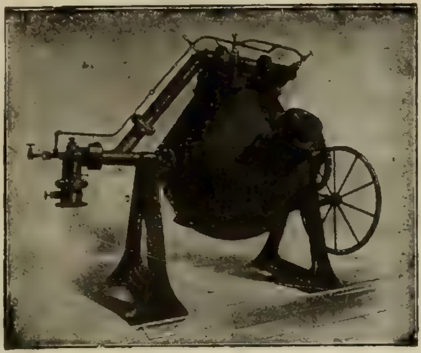

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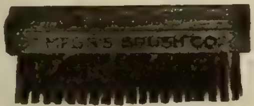

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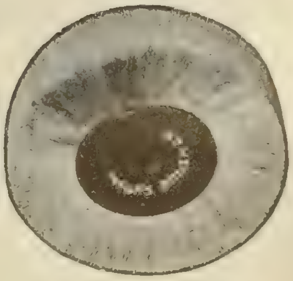

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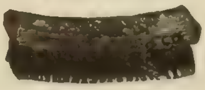

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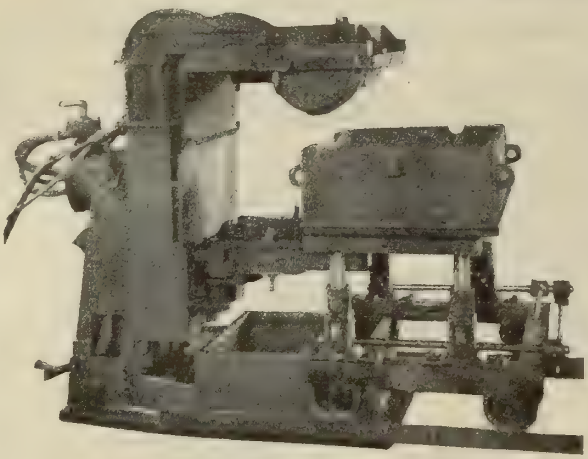

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So it goes; each for its purpose. This is not an intelligence office but intelligence is used in supplying the right Fire Brick for the right purpose.

I have the brands that have made Fire Brick history.

I carry these brands IN STOCK. Note the advantages: Every Brick reaches the user with clean, straight edges, uninjured, and every one is thus adaptable to a straight line of masonry in the brick wall. Again, many Fire Brick manufacturers are several months behind orders. I can accept your order IMMEDIATELY and deliver with reasonable promptness.

There is no duty on ordinary Fire Brick. I can ship Fire Brick, Cupola Blocks and Fire Clay in carlots or less. Write stating the service required.

FREDERIC B. STEVENS

Manufacturer of Foundry and Electro-Plating Supplies and Equipment.

DETROIT, MICH.

WAREHOUSE and OFFICE
Cor. of Larned and
Third St.

FACING MILL
Cor. of Isabella Ave. and
Mich. Central Railroad.

EXPORT WAREHOUSE
Windsor, Ont.

EASTERN SELLING AGENTS
Standard Machinery & Supplies, Ltd.
Montreal, Quebec.

Coralox Emery

Coralox is the highest grade abrasive known.

Coralox is made from pure Corundum electrically heat treated.

Coralox is not alone harder than any natural abrasive, but of a distinctive "temper" rendering it peculiarly adaptable to polishing all metals.

We carry large stock of Coralox in warehouse, Toronto, and are prepared to make prompt deliveries from this point.

If you are not already using Coralox, write us for sample to-day.

CANADIAN HANSON & VAN WINKLE CO., LTD.

TORONTO, CANADA

EDITORIAL INDEX—PAGE 308 BUYERS' DIRECTORY—PAGE 50 ADVERTISING INDEX—PAGE 56

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

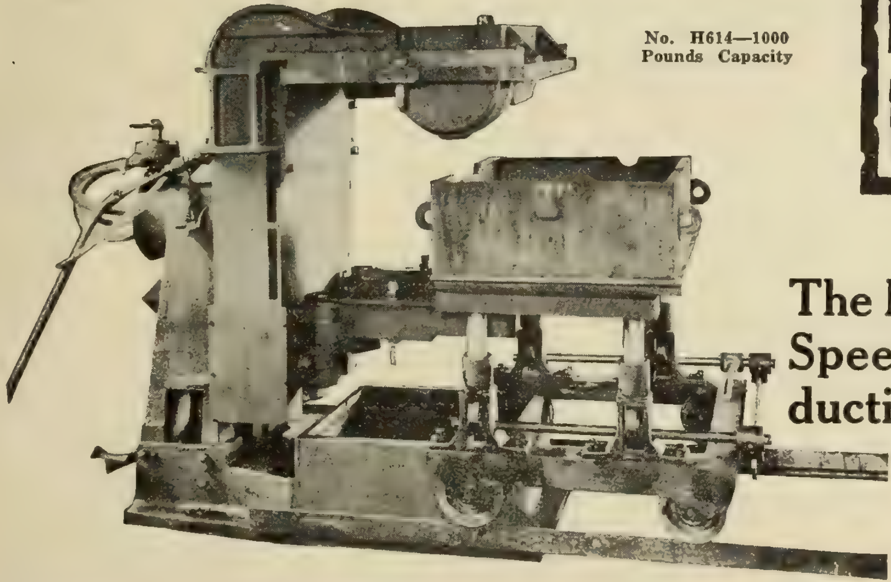
A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. IX. PUBLICATION OFFICE, TORONTO, DECEMBER, 1918 No. 12

GRIMES

JAR-RAMMED-ROLL-OVER

MOLDING MACHINE



No. H614—1000
Pounds Capacity

The Machine That Speeds Up Production and Cuts the Costs in the Foundry

Thousands of men left the industrial plants of America for war service. Still production was kept up to the maximum. Labor saving machines like the Grimes Jar-Rammed Roller-Over Molding Machine saved the situation. What has proved a big producer in War times will prove a big producer in Peace times. Install this machine. You'll need it for the strenuous competition of the future.

The Grimes Jar-Rammed Roller Machine operates smoothly and quickly. After the mold is rolled over, the air is turned into the lower end of the cylinder and the pattern is drawn. After the pattern is drawn the car raises the mold from the arms and takes it away from the machine. A vibrator is furnished with the machines. We make ¾", 1¾" and 2½" vibrators that vibrate and have a real kick.

LARGER SIZE Machines adapted to all kinds of work truck wheels, marine and tractor work.

GRIMES MOLDING MACHINE COMPANY
1218 HASTINGS STREET, DETROIT, MICH.
Formerly Midland Machine Company

KAWIN

FOUNDRY SUCCESS

Are You Prepared?

There is a world of opportunity ahead for Canadian Manufacturers. Devastated France and Belgium need rebuilding. They will look to this country for Machinery equipment of all kinds. The foundries that are equipped to produce quickly, efficiently and economically will get these orders.

Are you prepared to successfully meet all competition? Is your foundry so equipped that you can quote prices that will bring the business your way and at the same time enable you to make a good profit? Let KAWIN step into your plant and show you how you can do it.

KAWIN SERVICE

Saves Labor Waste and Material Waste

and guides you to the most economical and efficient methods of foundry production. It includes:

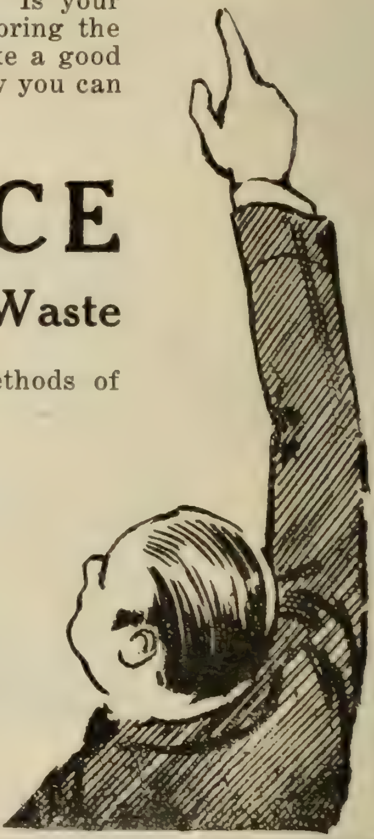
How to Make Proper Mixtures
How to Secure the Best Cupola Practice
How to Get Uniform Castings
How to Solve Moulding Troubles
How to Reduce Losses and Increase Your Output.

KAWIN SERVICE comes to you **guaranteed** to save **100%** over and above its cost. This is a fair proposition—you have nothing to lose and everything to gain. Get in touch with us. It will pay you.

Charles C. Kawin Company, Limited

CHEMISTS, FOUNDRY ENGINEERS, METALLURGISTS

307 KENT BUILDING, TORONTO   DUN BUILDING, BUFFALO, N.Y.
Dayton, Ohio   Chicago, Ill.   San Francisco, Cal.



LET US SELL YOU A

DOWNER GRINDER

(Made in the House that WOODISON built)

This grinder will increase your output at least 5% and many jobs can be finished in one-fifth of the time that it would take without a grinder.

It is one of the best labor-saving devices given to the pattern trade in the last two decades.

Three men can work together on one Downer Grinder without interfering one with the other.

There are less parts on the Downer than any other standard grinder.

It is the only machine that has a vertical drum in connection with two double-sided discs; is the only grinder the drum of which has a vertical and revolving motion simultaneously. There is no chance of having your work scored, it grinds absolutely smooth.

It is operated very economically and we recommend running it continuously, as it only takes 1/6 H.P., and a 3 H.P. motor will run it under most severe tests.

There are a great many other reasons why **you** should not be without a Downer Grinder.

Investigate further—we'll tell you all you want to know about it—you can't lose—write us right away.

When in the market for FOUNDRY SUPPLIES
don't forget us on

WOODISON QUALITY PARTING
WOODISON QUALITY WAX VENT
WOODISON PERFECT PERFORATED CHAPLETS
ATLAS BLACKING

And in fact anything else needed in your foundry, core room, pattern shop or polishing and plating departments. We have the most modern and up-to-the-minute facilities for giving you service.

THE E. J. WOODISON COMPANY, TORONTO

Detroit Boston Buffalo Cleveland Indianapolis St. Louis Seattle Montreal, Que. Windsor, Ont.

The Publisher's Page

TORONTO DECEMBER, 1918

What Do You Think About It?

IT is officially announced that Canada is to receive orders for millions of dollars' worth of material and supplies for reconstructing devastated Europe!

Mr. Lloyd Harris, Chairman of the Canadian Munitions Board in Washington, and Mr. Frank P. Jones, Chairman of the War Trade Board, Ottawa, are proceeding to England at once. Lloyd Harris has been instrumental in securing orders for millions of dollars' worth of munitions from Uncle Sam, and he can be counted on to get Canada's share of European reconstruction business. Mr. Jones is a team-mate worthy of his associate, and the pair, together with others who will be associated with them, can be relied upon to solve, in a large measure, some of the anticipated problems of the period of readjustment which was expected to follow the close of the war.

Then, too, the Railways are to have their innings, and their purchases of rolling stock and track equipment will keep our steel mills busy for some months.

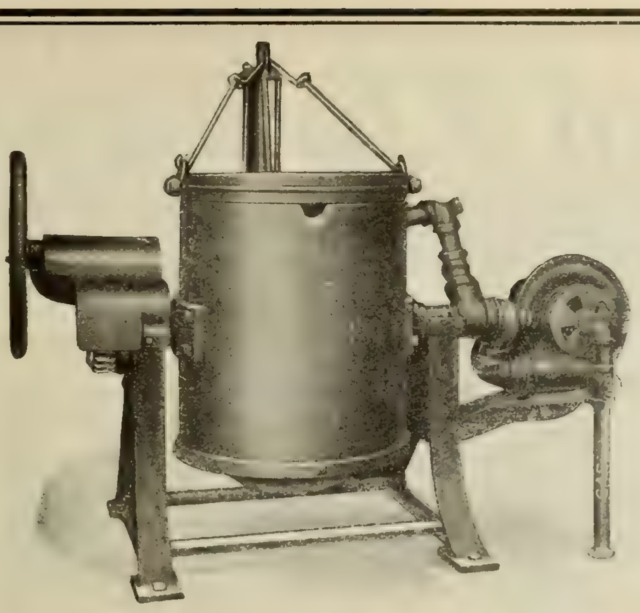
The shipbuilding programme of the Government is to be carried out and possibly enlarged, and the industries which have suffered through lack of raw material and supplies will be able to catch up.

The world is forming into a vast bread line, turning with appealing eyes and outstretched hands to America. Our production of foodstuffs must be greatly increased, and there should be no unemployment so long as there is an acre of tillable land that is not producing.

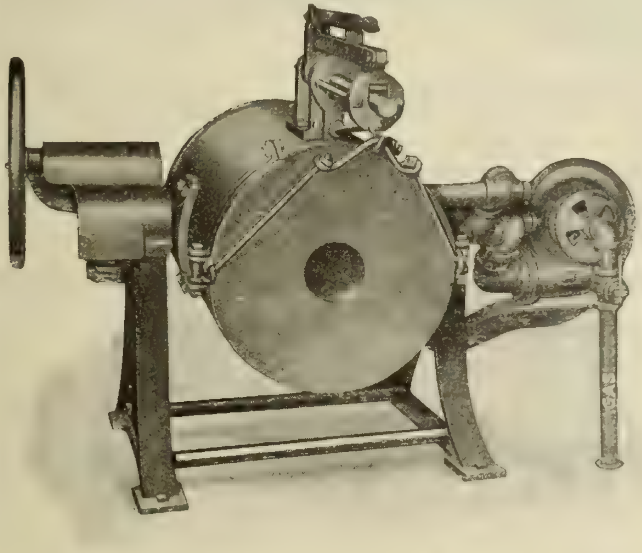
There were those who said that business would go to the dogs when the war broke out, and see what happened! There will be gloom spreaders rampant again, and if we would listen we would become gloomy, too.

This is a time for balance, for good judgment and optimism, for clear thinking, initiative and action. It is a time for thanksgiving and not for gloom. For unselfishness, for charity of thought and not for greed and parsimonious profit protecting. It is a time for kicking old policies and old doctrines into the street if they stand in the way of doing the things which better judgment says should be done.

Two shadows never made a ray of light and pessimists didn't win the war. Let us take fresh courage and face the future with faith, hope and confidence. We're living in a better world!



Front view of furnace equipped with Premix Motor Blower for Gas Fuel.



Front view, furnace tilted for pouring. The worm gear tilting mechanism holds furnace safely at any angle.

NEW
Monarch
VERTICAL MELTING FURNACE

Best-Paying Furnaces for Small, Quick Melts

BY no other means can you produce small melts as quickly, economically and as efficiently as with the **New Monarch Vertical Non-Crucible Tilting Furnaces.** They represent a big improvement in Melting furnace, and are designed to save time and cut costs.

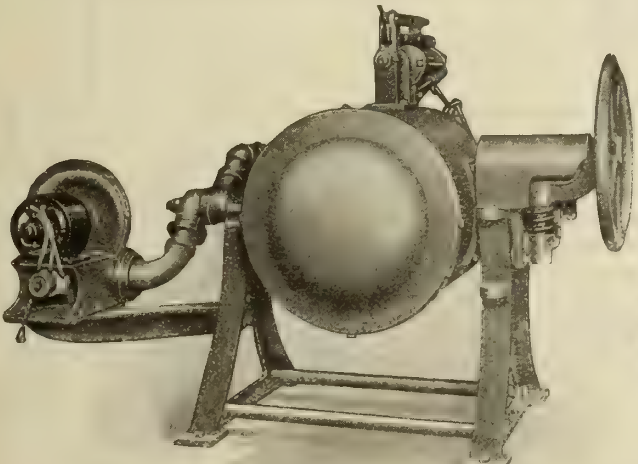
Melts Brass, Copper, Monel-Metal, Nickel, Aluminum, Bronze, Gold, Silver and any ordinary foundry mixture. Equipped with Premix Motor Blower for oil or gas fuel. Good for any line of air or oil system.

These are the furnaces you need for the big production period of the near future. Investigate them without delay.

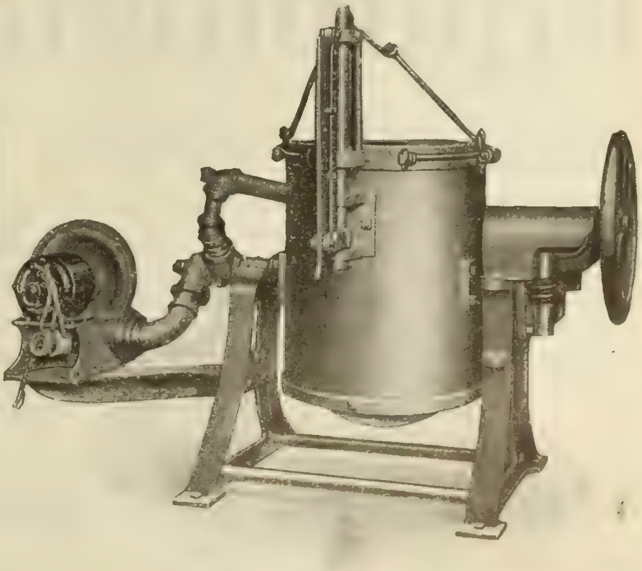
CATALOG E.F., 1918

The Monarch Engineering & Mfg. Company

Shops: Curtis Bay, Md.
1206 American Bldg., Baltimore, Md., U.S.A.



Rear view, furnace tilted for pouring, showing round bottom. Inside bottom corners are rounded, which eliminates loss from metal adhering to lining in corners and preventing the pouring of full contents. Adopted to any existing "air or oil and gas" line.



Rear view showing Permix Motor Blower and cover-lifting and swinging device. The gas or oil burns and melting proceeds continuously whether furnace is upright or tilted.

Crucibles of Quality

UNIFORM

Service and Durability
Ensure Economy.

Tilting Furnace
CRUCIBLES
Our Specialty.

Catalogue on request

A TRIAL WILL CONVINCE YOU.

Jonathan Bartley Crucible Co.
TRENTON, N. J., U. S. A.

SLY Foundry Equipment

To help your men have a bigger showing at the end of each day's work, give them **Sly Foundry Equipment.**

This is one way you can keep your output above normal in spite of labor shortage.

For example, the Sly Sand Blast illustrated will clean more castings daily than any other you can procure. It has great strength where others are strong, and it is strong where others are weak. There is practically no wear out to the nozzle.

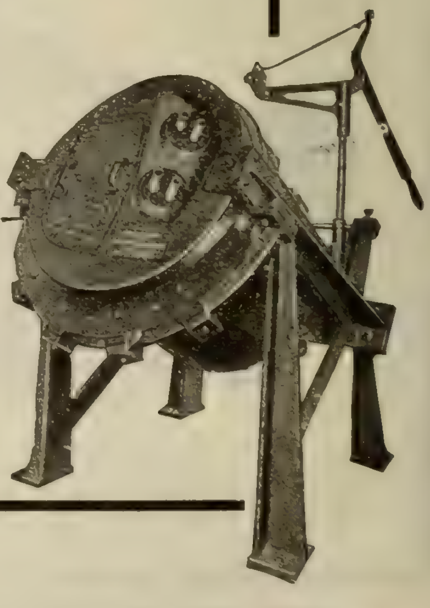
May we explain in detail?

These are Some of Our Lines

Tumbling Mills
Cinder Mills
Resin Mills
Dust Arresters
Core Sand Reclaimers
Cupolas

Full list upon request.

THE W. W. SLY MFG. CO.
CLEVELAND, OHIO, U.S.A.



Planning for War —and Peace

In the field of manufacture, as on the field of battle, American strategy has been a big factor in the winning of the war.

Our fighting men at the front, and our fighting men back of the front, down to the humblest of the workers in shop and shipyard, have given heroic demonstrations of their courage, initiative, resourcefulness and spirit of self-sacrifice.

Our war plans have made good. But what about our Peace plans?

Now that the Unconditional Surrender of the Hun looms as an imminent possibility, with its accompanying cessation of war orders and the resumption of intense competition, what does it mean to us industrially? Is it a threat or a promise?

We believe it is a promise—but only to those who continue to seek diligently *now* for better methods of management and production.

Looking over our own record of the war plans in the making and carrying out of which the Keller organization has been privileged to co-operate, it is gratifying to realize that while we have been working for the success of the Allied cause, we have also been working for the post-war success of ourselves and our customers.

By striving steadily to increase our production of Keller-Made Master-Built Pneumatic Tools, and to improve the tools themselves so that they can be depended upon to increase the production of the Shipyards, Shops and Foundries using them, we have not only "done our bit" to render certain the outcome of the great Battle for Democracy, but have at the same time and to the same extent helped to pave the way for the winning of the great Battle for World Trade that is to follow.

Preventable inefficiency is Treason during the war
After the war it will be Business Suicide.

KELLER-MADE
PNEUMATIC
TOOLS
MASTER-BUILT

William H. Keller President

KELLER PNEUMATIC TOOL COMPANY, GRAND HAVEN, MICH., U. S. A.

Does It Not Seem Reasonable

If you want to produce GOOD Castings you should use GOOD Material

Makers of cheap Blacking cannot afford to use expensive material, so the Foundryman gets just what he pays for when buying cheap blacking.

Here are some of our Leaders which carry our personal guarantee with them:

STEVENS CARBON BLACKING
STEVENS EAST INDIA PLUMBAGO
STEVENS COLUMBIA PARTING
STEVENS BLACK CORE COMPOUND and
NELSONVILLE FIRE CLAY

A trial barrel will convince you.

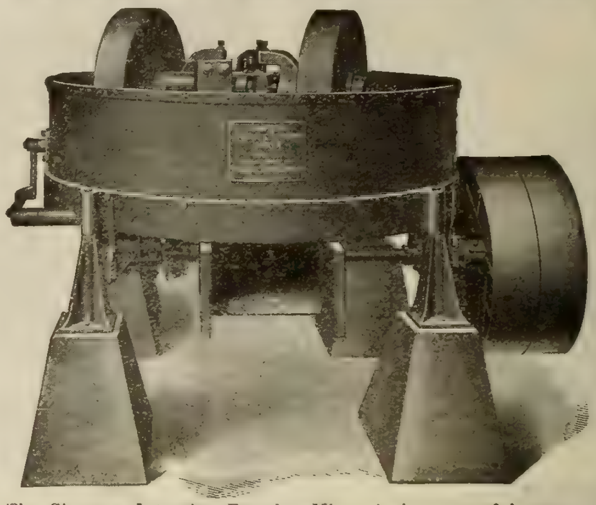
Prompt shipment from our Montreal Warehouse.

Standard Machinery and Supplies, Limited
261 Notre Dame Street West
MONTREAL

A Message to Canadian Foundries
THE SIMPSON INTENSIVE FOUNDRY MIXER
Saves Both Sand and Labor

Improves the quality of the castings.

Corrects "scabbing" due to imperfect mixing of facing sand. Saves compound when mixing core sand, and coal dust when mixing facing sand by reason of the thoroughness of its work.



The Simpson Intensive Foundry Mixer is in successful operation in some of the best known foundries in Canada.
Write for details and prices to

National Engineering Co.
Machinery Hall Building
549 W. WASHINGTON Blvd., CHICAGO, ILL.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best** possible wheel for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers of Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

Now that the War is Won some readjustments are necessary in your foundry practice

Let us look back.

Did the foundrymen help? They certainly did.

Did Semi-Steel Shells help beat the Huns? We say "Yes." All right; give us a little credit—please.

About one year ago we claimed in our ads:

> **"If we had a Charlie Schwab in the iron foundry game millions of semi-steel projectiles would be cast of McLain's semi-steel instead of cast or forged steel."**

We made cupola practice fool-proof; that is how it is possible to make Semi-Steel Shells that have replaced *steel* shells.

Fogy ideas and tradition must be eliminated. You must quit operating your cupola as you did 100 years ago — LEARN OUR WAY. Many object to new ideas they don't understand—scientific melting is no exception—

BUT WE HAVE MADE CUPOLA PRACTICE FOOL-PROOF.

A few years ago foundrymen said semi-steel shells were impossible. Since then there have been several hundred million made. It is claimed semi-steel shells saved France and if so, they saved you, too. THINK THIS OVER, and don't say a thing cannot be done because your competitor across the street may be doing it.

Send us your order *now* with the name of YOUR BANK and we will forward you McLain's System complete with SIGHT DRAFT attached. You will receive a report on your cupola practice also. The price of McLain's System complete is $100—you don't pay for it until your bank receives it and notifies you.

Full information free—to save time, send us your order.

SEMI-STEEL SHELLS SAVED FRANCE AND SAVED YOU TOO

McLAIN'S SYSTEM, INC.

700 Goldsmith Bldg. **Milwaukee, Wis., U.S.A.**

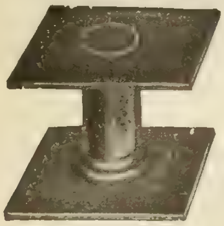
12-18

Tumbling Stars

DURABLE AND EFFECTIVE CLEANERS

Made of a Special Grade of Hard Iron

The kind that do not wear out for a long time.



CHAPLETS

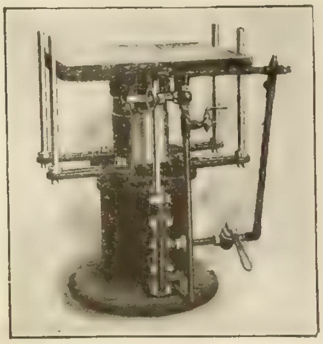
of every description

Perforated, Forged, Riveted and Electric Welded

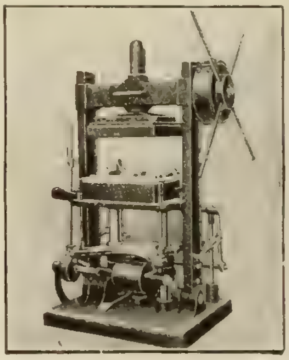
The Fanner Mfg. Company
CLEVELAND, OHIO
Mark Inquiries Dept. C.

British Moulding Machines

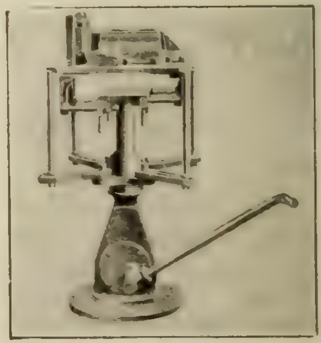
AND FOUNDRY EQUIPMENT



The JARR RAM (Pneumatic).
The Machine with a Perfect Lift.



The HEAD RAM.
Most powerful Hand Machine made.



The HAND RAM.
Adjustable to any size box.

The most efficient Machines, built to stand rough usage

Write for Catalogue to

BRITANNIA FOUNDRY COMPANY
COVENTRY, ENGLAND

BRIQUET INGOTS

for the Arts of Peace

With the war-demon chained, we hope **forever,** the arts of peace will clamor for brass and **more** brass; and every ounce that both Canada and the United States can produce will be required for railroad, marine and industrial work, at home and abroad.

BRIQUET-INGOTS
(Trade Mark)

will serve peace as they have been serving war by putting into meltable form thousands of tons of chips and finely-divided scrap—purified of iron and all other foreign substances.

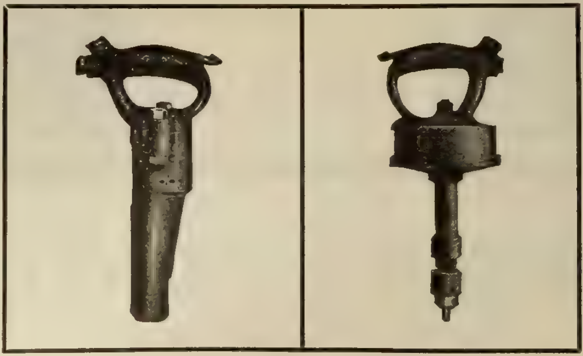
COPPER, TOO

A later development is the purification and briquetting of copper shell-band turnings and similar copper waste. This is done, for the present, at our Chicago plant only.

Briquet-Ingots are made only by us. The name is our trade-mark and the processes and machinery patented. **Briquet-Ingots** are practically as uniformly pure and permanently solid as virgin cast ingots, though no heat and no binder are used in their manufacture.

if Interested in carlot business, address

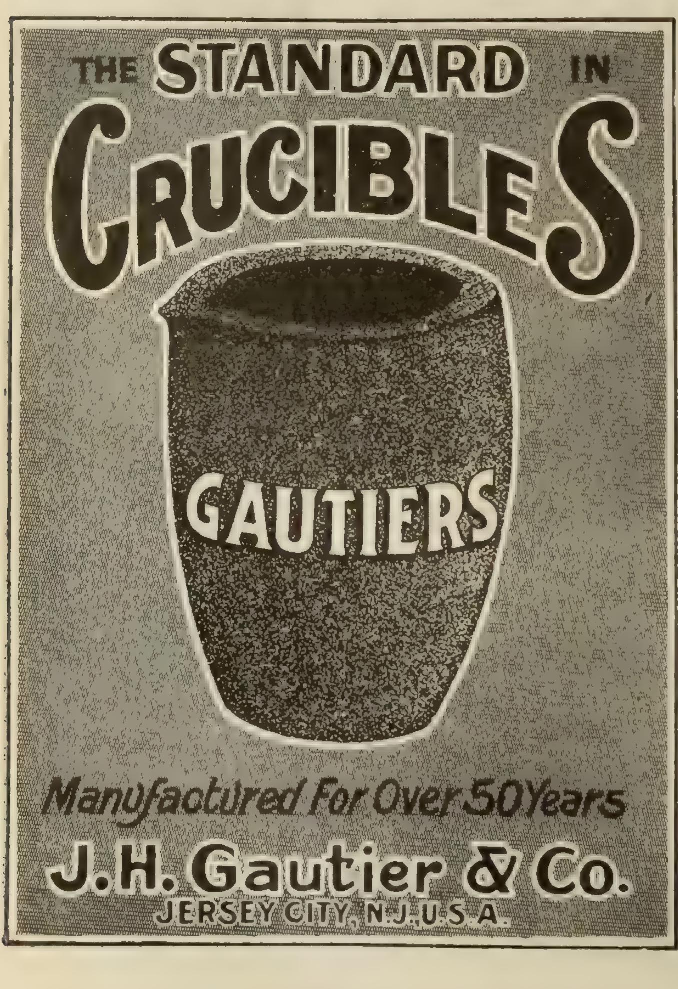
EASTERN BRASS & INGOT CORP.
of NEW YORK
Waterbury, Conn.
METAL BLOCK CORPORATION
208 S. La Salle St. Chicago, Ill.



"LITTLE DAVID"
Pneumatic Tools
are useful in the Foundry

CANADIAN INGERSOLL-RAND CO., LTD.

With Offices at
SYDNEY, SHERBROOKE, MONTREAL, TORONTO, COBALT, WINNIPEG, NELSON, VANCOUVER



THE STANDARD IN
CRUCIBLES
GAUTIERS
Manufactured For Over 50 Years
J. H. Gautier & Co.
JERSEY CITY, N.J. U.S.A.

BUFFALO BRAND

Look for the
Buffalo
on the octagon
Cardboard Spools

VENT WAX

Our customers are our best advertisers. A few of their remarks at the Milwaukee Exhibition were:

"The easiest and best way to vent any core."

"Have used BUFFALO BRAND for years and it never failed yet."

"No other Vent Wax for me: I know what BUFFALO BRAND will do."

Etc., Etc.

Let us add your name to our list of advertisers.

Write for trial spool and prices.

Be SURE it's "BUFFALO BRAND."

UNITED COMPOUND CO.
228 Elk St., Buffalo, N.Y.

This machine has been rightly called the "shock absorber" for foundry operation

Blystone Core Sand Mixer

"SPEED-UPS" and "SLOW-DOWNS" come suddenly these days.

Every order to speed up or slow down your foundry produces a shock in your production scheme and costs.

Every shock means readjustment—and you can't take your own sweet time about readjusting. It's got to be done in a hurry.

On a "speed-up" order the Blystone enables you to increase production quickly without an equally quick increase in labor force. The same labor force can absorb a lot of increased production.

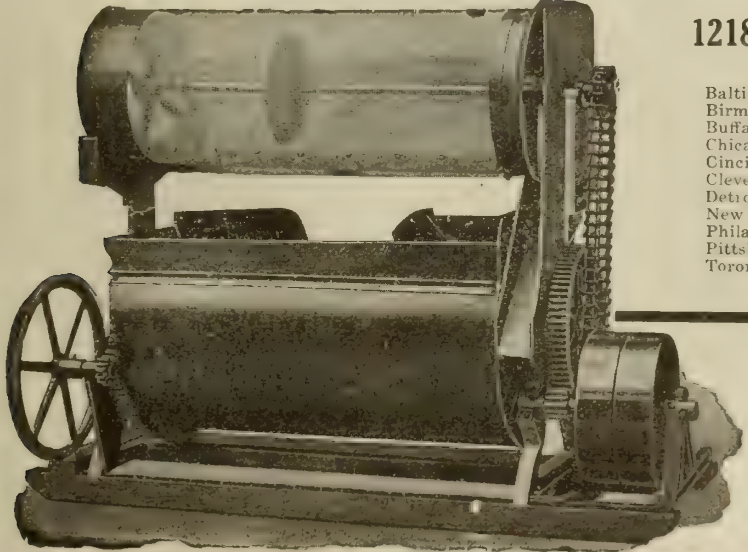
On a "slow-down" order the Blystone enables you to cut down your force quickly to the lowest possible minimum. Fewer men can handle the smaller production.

The Blystone lessens the shock of readjustments by reducing the mixing labor to bed rock and speeding up the mixing. It is now "indispensable" equipment in more than 1,000 leading foundries in the United States and Canada.

It won't cost you a penny to find out what a Blystone will do in your foundry. We have one all ready to ship to you for a 10-day trial.

Write or wire for prices
Mixers shipped promptly

Made in 5-7-14 cubic foot capacities



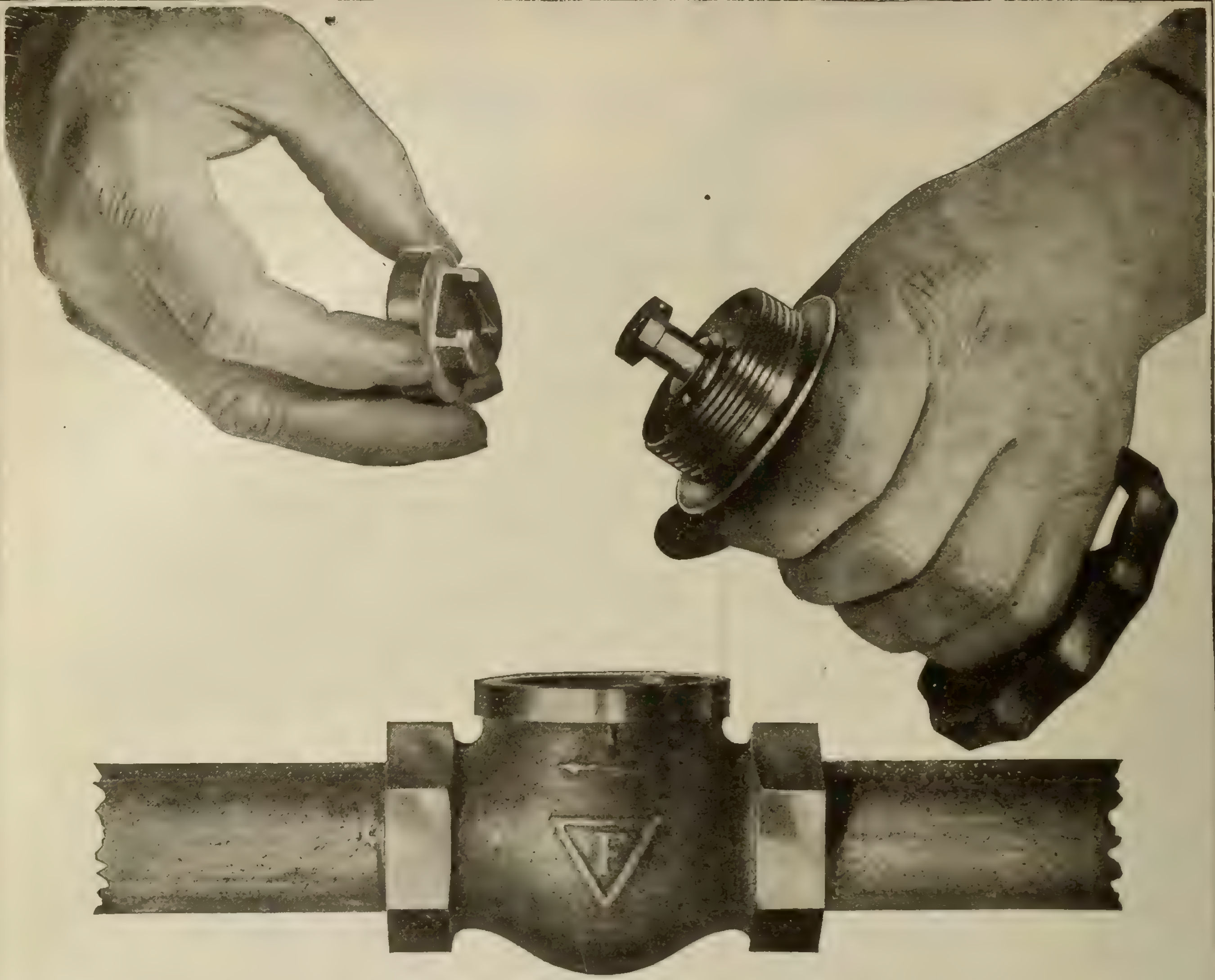
Blystone Manufacturing Co.

1218 Spring Street Cambridge Springs, Pa.

Baltimore	J. W. Paxson Co.
Birmingham	Hill & Griffith Co.
Buffalo	E. J. Woodison Co
Chicago	Scully-Jones & Co.
Cincinnati	Hill & Griffith Co.
Cleveland	E. J. Woodison Co
Detroit	E. J Woodison Co
New York	Wonham, Bates & Goode, Inc
Philadelphia	J. W. Paxson Co.
Pittsburgh	J S McCormick Co
Toronto	E. B. Fleury

The BLYSTONE SAND MIX
Known as the thorough mix

Let the thoroughness of mixing be your first consideration in buying a mixer. The Blystone mix is recognized as the most thorough and uniform mix in existence—by every test.



FAIRBANKS RENEWABLE DISC VALVES

WOULD REDUCE YOUR VALVE EXPENSE EVEN THOUGH THEY COST DOUBLE THE PRESENT PRICE. THE BAKELITE DISC GIVES MAXIMUM SERVICE UNDER ALL CONDITIONS OF STEAM, AIR, AND WATER. WHEN THE DISC DOES WEAR OUT, IT CAN BE REPLACED IN LESS THAN ONE MINUTE WITH ONLY ONE TOOL—A WRENCH TO REMOVE THE BONNET. SPECIFY FAIRBANKS VALVES ON YOUR ORDER.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

DEPARTMENTS

SCALE, VALVE, STEAM GOODS, ELECTRICAL, AUTOMOBILE SUPPLY, TRANSMISSION, OIL ENGINE, MACHINERY, PUMP, CONTRACTORS, RAILWAY, MACHINE SHOP SUPPLY

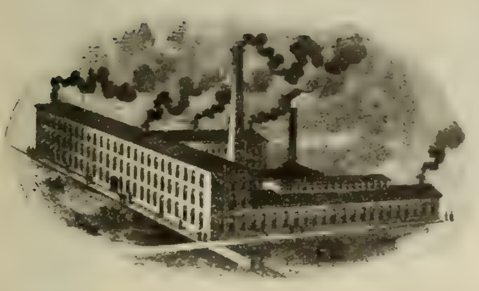
SALES OFFICES

HALIFAX, ST. JOHN, QUEBEC, MONTREAL, OTTAWA, TORONTO, HAMILTON, WINDSOR, WINNIPEG, SASKATOON, CALGARY, VANCOUVER, VICTORIA

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

The Electric Furnace in the Grey Iron Foundry

Converting the Lowest Grade of Scrap Iron Into the Highest Grade of Pig Iron—Its Practicability Clearly Demonstrated and Its Future Forecasted in a Favorable Light



WORKS OF THE BOWANVILLE FOUNDRY CO.

THE Bowmanville Foundry Co., whose works are shown in the accompanying illustrations, can proudly claim the unique distinction of being the pioneers in Canada of melting gray iron for ordinary foundry purposes by electricity, and in doing so have demonstrated to their own satisfaction as well as to that of others who have seen the process in operation, that the electric furnace in the iron foundry has a future before it full of promise. As every foundryman is aware, the demands upon the available iron supply during the years in which the war was in progress were so great that it became necessary to conserve every possible pound of iron, either to be converted into steel or else to be used in such iron castings as were required to help in some way to win the war, and those foundrymen who were not engaged in turning out some line of war material found it an exceedingly difficult matter to secure supplies. Here was a company who had long enjoyed the enviable reputation for producing a line of high-grade light gray iron castings, including stove trimmings, piano trimmings, piston rings for automobile engines, hardware and novelty specialties, all of which required the highest grade of pig iron. In addition to this they had a department for the manufacture of light steel castings in which they had just recently installed an electric furnace of 500 lbs. capacity. They also have a nickel-plating and polishing department, a polished brass department, and a wire goods department, fully equipped with electric welding machines, etc., but, unfortunately for them, none of their lines could be considered essential from the standpoint of wining the war, and as a consequence they were debarred from securing the raw material with which to keep their works in operation. To all of this they cheerfully acquiesced, but in doing so they found themselves with only two alternatives to choose from. The one was to close down until after the war (a proposition which was not to be considered) and the other was to secure iron from some source, and in this they were successful. As has been previously mentioned, the class of work being turned out was such that nothing but high-grade pig iron could be used, and if good scrap could have been secured it would not have filled the bill, but even this was not easily procured, but the source from which they were enabled to draw was the cast iron turnings and borings of which every machine shop has an abundance, and which had hitherto been considered as of little practical value, and by utilizing the electric furnace the difficulty was solved.

C. E. REHDER,
Vice-President and Assistant General Manager Bowmanville Foundry Co.

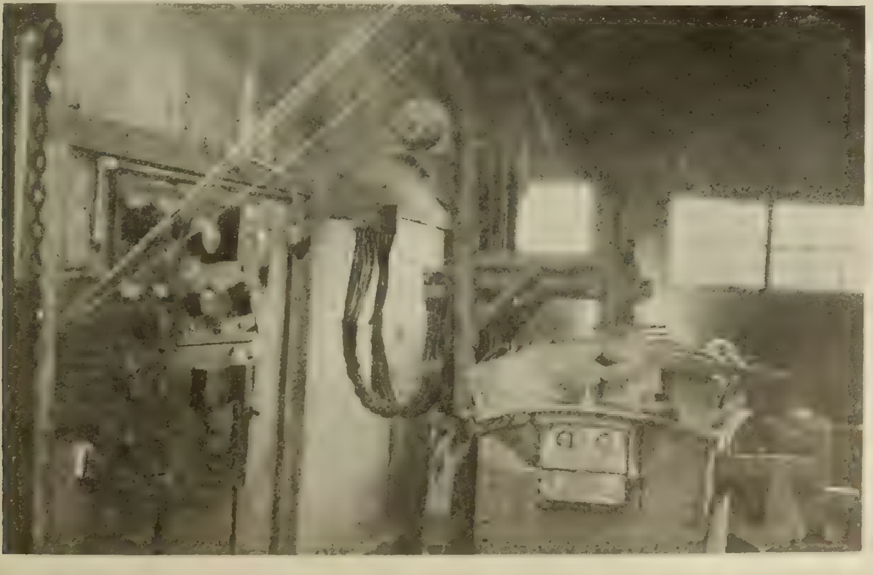


FIG. 1—SHOWING CHARGING DOOR, ALSO CONTROL BOARD WITH WIRES CONNECTING TO ELECTRODES

Had this class of metal been charged into the cupola the bulk of it would have been blown out through the stack and the balance would have been mostly slag. With the electric furnace none of this trouble is experienced as there is neither blast nor fuel to contend with, and consequently no oxidizing, and very little carbonizing.

The furnace, shown in the accompanying engravings, Figs. 1, 2, 3 and 4, as well as the control board (also shown in Figs. 1 and 2) and the transformers, were installed under the personal supervision of Mr. C. E. Rehder. The furnace was manufactured under Gronwall patents, and the control is of a type manufactured by the General Electric Co.

The electrodes are controlled automatically by d. c. reversible motors, with shunt field to act as a magnetic brake, but can be controlled by hand if so desired; control board is operated by 110-volt d. c. current, with raising and lowering control for each electrode.

This furnace operates on a two-phase circuit, each electrode carrying one leg of each phase and the bottom or hearth is conducting and acts as neutral or common carrier for other leg of each circuit.

The primary supply is three-phase, and is connected by a modified "Scott" connection to the two transformers. The transformers have a capacity of 75 k.v.a. each. The furnace, as we have 10-hour day will melt 4 heats, but if successfully handling 625 lbs., and in a 10-hour day with melt 4 heats, but if run continuously will melt 13 heats in 24 hours. To accomplish this requires 650 kilowatt hours per ton of cast iron, and an average of 8 lbs. of electrode per ton of iron.

For the benefit of the practical foundryman who is not familiar with electrical phraseology we will endeavor to explain in as intelligible a manner as possible the construction and management of the electric furnace. It consists of a steel shell of the design shown and lined with what is known as magnesite brick, leaving a basin or crucible 24 inches by 36 inches and about 16 inches deep below the level of the door. The metal is charged into this brick basin through the end door shown in Fig. 1, and the electric current enters from the top through the electrodes, also shown in Fig. 1 attached to what would appear to be a jib crane. The manner of melting will perhaps be better understood if compared to an electric arc lamp with its upper and lower carbon, and the electric arc between them. If the bottom carbon is removed from an arc lamp and an iron one put in its place the arc would still form and cause light for a short time, but the iron would melt away and the top carbon would follow it until it was all melted. This is precisely what takes place in the electric furnace; the iron which is to be melted takes the place of the bottom carbon, while the electrode acts as the upper carbon. As the iron melts it falls to the bottom of the basin, and when all is melted, silicon, and whatever other elements are required to bring the metal up to the proper chemical analysis are introduced through the charging door and are rapidly absorbed by the melted iron. The electric current keeping the metal in continuous motion, thoroughly mixes it and at the same time purges it of impurities. Lime is used as a flux and to form a slag, while fluorspar is used to regulate the fluidity of the slag. When the metal is melted to the proper temperature the electric current is turned off and the slag is drawn from the door shown in Fig. 2.

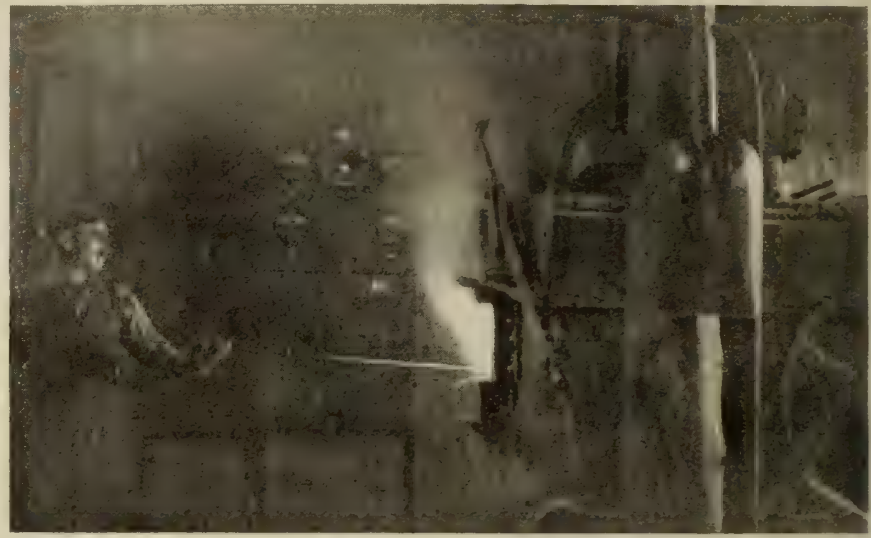


FIG. 2—SHOWING WORKMAN SKIMMING OFF THE SLAG

In Fig. 3 is shown the tilting mechanism on the side, also the spout at rear end with workman opening the tap hole preparatory to pouring.

Fig. 4 shows method of pouring into pig bed; the furnace, resting on trunions, is tilted by means of hand wheel and gear on the side. This iron was poured into pigs, which were later melted in the cupola in the ordinary way, the double melting entailing extra expense, which would be unnecessary if the furnace had been installed with a view to being used in the gray iron foundry, and the company has plans for an overhead carrier system to deliver the iron to the molders and do away with the second melting.

That the electric furnace will become a successful competitor with the cupola furnace is certain on account of the ease with which special mixtures can be melted and the quality of the resultant metal. The one outstanding drawback is the original cost. On this point we will quote abstracts from a paper by John A. Crowley of Detroit, an expert on the

Continued on page 295

FIG. 4 SHOWING METHOD OF POURING INTO PIG BEDS

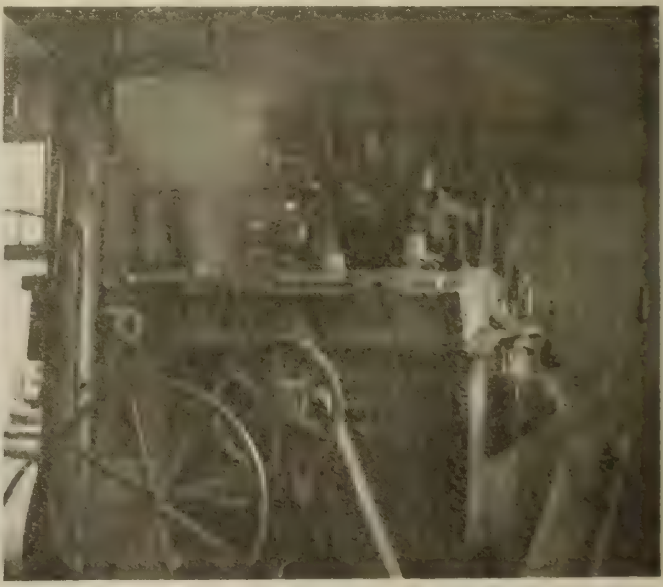
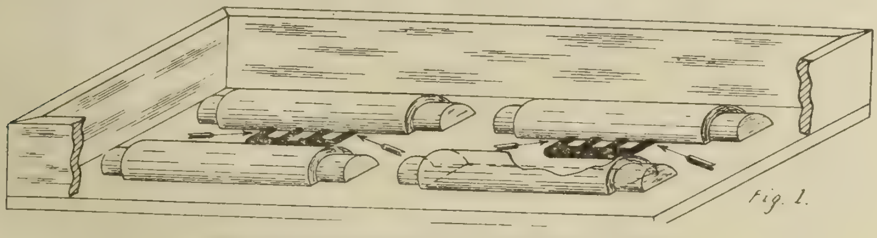


FIG. 3 SHOWING TILTING MECHANISM, ALSO SPOUT AT REAR

Pump Cylinders on the Stripping Plate Machine

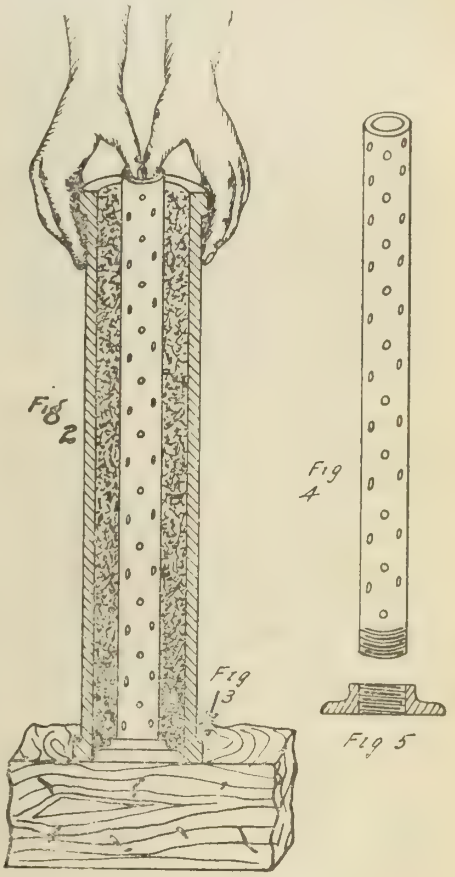
Importance of Proper Ramming Greatly Under-estimated

"RAM and Shovel" is a somewhat unsavory reflection too often cast upon the molder and his profession, from which the inference is ence is to be drawn that molding consists of shoveling sand into a flask and pounding it with a rammer, but expression is more frequently used with reference to those who operate molding machine. The ramming and shoveling would of course be much the same in either case, and if that constituted the entire trade of molding there would not be so very much to it, but even at that there would be more to it than is generally conceded. To have the sand properly tempered and prepared is of the greatest importance in molding, but in this article it is the intention to dwell more particularly on the subject of "ramming." To properly ram a mold requires as much care, and I might say, as much skill as any part of the work. A deep mold requires to be rammed harder at the lower part in order to resist the greater strain, while a pattern with coreprints for horizontal cores requires to have the sand rammed harder around the prints than elsewhere in order to help hold the cores in place. In fact almost any job has parts which call for extra ramming in certain places. While it is true that the molding machine will produce castings much more rapidly and truer to the pattern than can be done by ordinary hand molding and at the same time requires a less skilled workman, the ramming really requires greater judgment, but it is amusing the way the average molder looks upon this matter of ramming. If a casting is lost through wet sand or dull iron or what not, it is usually attributed to being rammed too hard, but seldom to not being rammed hard enough. To illustrate the importance of proper ramming (not hard ramming or soft ramming) but proper ramming, let us describe the molding of pump cylinders on a stripping plate machine. I was once employed by a company who manufactured a line of pumps, and while I was not one of the machine operators I was working in the same room and could see what was doing, and would willingly have rendered aid if my good will had been appreciated, which it was not. The castings were dirty, right in front of the gate, and I have seen them with slots big enough to run a knife blade through from the outside to the core. When I suggested that the ramming had something to do with it, the idea was not considered. The fellows all knew that the trouble was in the iron and as a consequence all kinds of experiments were tried to overcome it. Instead of using ordinary judgment in the ramming, the gates were changed into all kinds of shapes with a view to keeping the dirt back, and along with this they poured them with all pig iron, all scrap iron, semi steel, etc., and they poured them very hot, and very dull, but all to no purpose. The last I saw of them they were using molasses on the gate. Had the molds been properly rammed there would have been no trouble. The equipment was the very best, the company having spared no expense in their effort to have things right. The patterns, four in number, were fitted to a stripping plate as shown in Fig. 1. The gate was dowelled to the plate and was connected to two of the patterns on the same side of the mold. The cope and nowel were exactly the same and in turning the cope over the gate would be reversed so as to connect with the other two cylinders. In ramming them it was the custom to peen around the outside and down the centre between the rows, care being taken to keep well away from the patterns. Had these patterns been rammed up on a board, the molder would undoubtedly have tucked the sand around them with his fingers, and after rolling the nowel over he would have rubbed the sand up to the pattern with the palm of his hand and troweled it, and in cutting the gate with a gate cutter he would have finished it with his finger or thumb and finally sponged it. With the molding machine the tucking and ramming must do it all, as there is no chance to make any changes after it is rolled over and unless it is properly done the part right up against the pattern will be so soft that it will wash from the iron running over it with the results already described. In doing this class of work on a machine it is not the rule to do much finger tucking, but if the molder will hold his rammer on an angle so as to drive the peen right down into the corner shown by arrows on the sketch, it will make it hard enough to hold its shape and it can do no harm.



MOLDING CYLINDERS ON STRIPPING PLATE

There is nothing can beat the stripping plate for making nice castings and these cylinders were perfect with the exception of the dirt which could have been avoided by proper ramming. The manner of making the green sand core was also interesting and if in the hands of a man who was not too timid it worked all right. The core box consisted of a box Fig. 2 bored out to the size and length of core required and it was stood on end on a block of wood as shown at Fig. 3. The arbor consisted of a piece of pipe, Fig. 4, drilled full of holes and screwed into a washer, Fig. 5, of the same size as the core, or a shade less. This arbor was clay-washed and stood on the block of wood and inside of the core-box. The box was next filled with molding sand, and the molder by putting his two thumbs back to back into the arbor, and his fingers outside of the core box (see Fig. 2), raised box, arbor and sand together, and jolted them straight down against the block. As the sand went down more was put in and jolted again and finally tucked with the fingers at the top. Here again was trouble; the sand would sometimes fall off of the arbor, but this was because it was not jolted hard enough.



HAND JOLTING GREEN SAND CORES

There is nothing to fear. That big iron box jarring against the block would appear to create quite a commotion, but that has nothing to do with the sand. The sand has nothing but its own weight to contend with and if properly jolted, it makes a nice firm core. By rapping the box on the side so as to loosen it, the core can be drawn from the top by pulling upwards on the arbor. By placing a finger in the lower end of the arbor, the core is brought to the horizontal and placed in the mold. Here is a case where I think that the molder will favor the machine rather than the hand method. To jolt this job by hand was pretty heavy work and if this had been put on a power jolter it would have done away with the bulk of the hard work, and would have been a good competitor with any other mode of making such cores. A revolving arrangement with arbor long enough for several cylinders is all right but it represents a big outlay and besides it takes more than one man to handle it.

Let me say in conclusion that hard ramming is rarely the cause of defective castings. Common sense should dictate that while a mold must not be rammed too hard, it should be rammed hard enough, and rammed hardest where hardest ramming is required. Stripping plates and match plates always require to be rammed harder on the parting than molds with sand partings. Ramming the cope will make a soft parting harder if the parting is sand. With the plate there is no chance to do anything after the drag is rolled over. If a mold is rammed too hard and not sufficiently vented it is apt to scab, and if it is a thin piece it will cold shot, but I never experienced a blow from this cause. A hard mold might scab and in so doing might open some of the vents and allow iron to enter, in which case it might blow. It is always best to study each job and do it according as the job requires.

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MOLDING IN HOT SAND

Every molder knows that hot sand is a nuisance and avoids it wherever he can, primarily because it sticks to the pattern and to a certain extent because it tends to soften the cores which will be put into the mold. But all things considered, everything is against using it and nothing is in its favor excepting shortage of space. Where much pit work is being done it is not always convenient to avoid working in a hot pit and as a consequence have the bottom half of the mold hot. Even cold sand steams to a certain extent as will be shown by leaving patterns or tools lying about on top of the finished molds which have been made from cold sand. They will be damp on the lower side. The warmer the sand is the more it will steam, and it is the steam which makes the trouble. I have in mind a batch of boiler fronts which I once had to make. The method employed was to bed them on the floor and not being very heavy castings we did not consider the heat of the pit very seriously. The hot sand was wet down and cut to one side to be used in the cope, and cold sand was used in the pit. But the pit was heated deeper down than was anticipated and while it did not bother any in making the mold it did its work after the mold was closed. None of the castings were what they should have been. They were blown and scabbed and streaked to such an extent that I began to feel very keenly what would be thought of me as a workman. I knew it was being traced to hard ramming and wet sand, etc., and I also knew that the trouble was not from that source. I certainly thought that I knew how to temper and ram my sand, and besides I had an idea where the trouble was, so when the time had about arrived to pour one, I went to the foreman and requested to have it lifted off, which was done, and there the whole thing was before our eyes. Moisture had gathered on th cope to such an extent that it hung down like icicles and in several places had fallen off, leaving pools of water on the bottom face, and the iron on entering would have been forced to run between two sheets of water, which every molder knows can not be done successfully. I left this one open as long as I could and its own heat helped to dry it, and with the aid of a torch and some parting sand I got it in shape and by keeping them open until the last hour I managed to use it all right, but it is best to avoid hot sand and hot pits as much as possible.

GATING AND POURING OF MOLDS

By H. E. McINTYRE

In the October number of the CANADIAN FOUNDRYMAN, I read an exceptionally interesting article on gating and pouring, which I must confess struck me as being about as good as anything I have read on the subject. A man may work at molding all his life, yet little things like this will crop up now and again which he had never looked at in the same light. I, too, had an experience once, which, while perhaps not exactly the same, was along a somewhat similar line. I had some automobile transmission cases to make; they were about 18 inches high, 12 inches long, and 3-16 inches thick, and the metal with which they were poured was 15 per cent. steel.

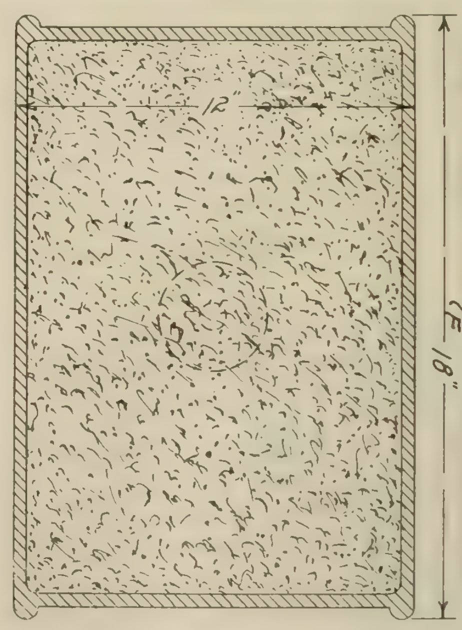

Fig 2.

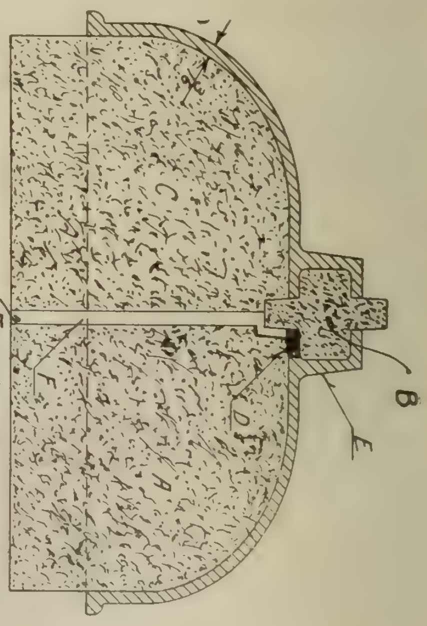

Fig. 1

Fig. 1 shows side view of how cores were placed. Fig. 2 shows end view. As I have said, this is a casing, and is of course closed everywhere excepting at the end shown in Fig. 2. The part enclosing the core marked B is round, while the part marked A and C is as shown at Fig. 2. In setting the cores, A is first put into place, after which B is placed with inside print resting on A, in core print arranged for the purpose. C is next put on, holding B in place; A and C fit tight together. Our method of gating was to cut a gate ¼ in. wide and 1¼ in. deep on the parting at the point marked D. As will be seen, the iron, on entering would shoot right through the space between the cores A and C, and, strange as it might seem, it would not come back and fill the space E, right alongside of the gate if it was the least bit dull. After repeated failures I changed the gate and placed it at F and cut a gate in the joint between the cores A and C right up to the very spot where it was originally gated, and had no further trouble.

Now I have a problem which I wish to put before your readers in the hope that someone can offer a satisfactory explanation. Sketches 3 and 4 show a 4-block cylinder and crank case cast in one piece, which made quite a complicated job to do.

Fig. 3 is top of casting as it lay in the sand; Fig. 4 is the end of same as it lay in the mold. The core was filled with coke, and the vent was taken off at C, D, E. The castings were giving trouble through blowing at G, and in some cases the blow started at F, Fig. 3, and ran to G.

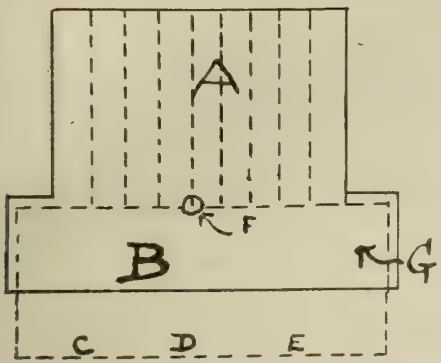

FIG. 3—TOP OF CASTING AS IT LAY IN THE SAND

F is a green sand core about 2½ in. diam. by 6 in. deep.

As will be seen in Fig. 3, the dotted lines at A are cylinder barrel cores while the dotted lines at B are the crank case cores, and it was these cores B which made the trouble. The gas seemed to form a pocket, and not being able to escape properly would blow. By moving the vent hole E one inch farther from D it did away with the blow, which had every appearance of coming from near F. I know it effected the required result but cannot explain why. Perhaps someone can enlighten me?

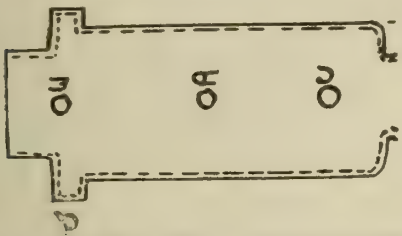

FIG. 4—END OF SAME AS IT LAY IN THE MOLD

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MAKING PULLEY FROM HALF PATTERN

Question—I wish to make a pulley 18 inches diameter and 10 inches face, and I can only find half of the pattern and it is 4 inches face and has half thickness arms attached to it. The arms, four in number, are slightly curved. Is it possible to get what I want from this partial pattern?

Answer—It is possible, although quite an undertaking. If you require the arms to be in the centre it will be a little bit more of a job than if six inches could be below and 4 inches above. To make it with the arms midway, place your nowel on the smooth board and put an inch thickness between the pattern and board and ram up in ordinary way, strike off and bed on bottom board and roll over. Next draw the pattern up level with joint, and after tucking under the arms with sand, make a true, firm parting, putting on parting sand as usual. Now swab the pattern and draw it out. Shape some partimole or parting sand into the arms and fill them up level with molding sand being careful not to get any sand in the rim. The pattern will now be turned reverse side up and placed on top of the impression in the nowel, being careful to have the rim true, and as much of the arms as possible in line with each other. The cope is next rammed up, being well gaggered and soldiered. The guide pins must be in good condition, and corner guides would be advisable. After lifting off the cope and rolling it back, inch strips are fastened to the cope joint and the pattern drawn an inch and tucked under with sand, and a true parting made. This additional inch of sand will require to be well fastened with nails. The pattern is now swabbed and drawn out, and the cope finished. By shaking soapstone or any white facing on the nowel and black lead on the cope, and trying the cope on and off, it will not only show if the joint fits properly, but will also show the impression of the cope half of the arms onto the nowel, so that the arms in the nowel may be shaped exactly with a gate cutter and spoon slick. The object in filling the arms with sand was to hold up the weight of the pattern while ramming the cope. If the arms are away off it would be as well to fill the bottom ones permanently and cut new ones to correspond with the cope.

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THE ELECTRIC FURNACE IN THE GREY IRON FOUNDRY

Continued from page 292

subject. He says: "A volume might be written on the subject of furnace design, yet in this paper I wish to touch but briefly on the mechanical and electrical characteristics of the furnace designed for foundry operation. It is often difficult for a foundryman to appreciate the cost of building an electric furnace, and when shown the figures, the average foundryman considers the price as exorbitant. In discussing furnace design, one furnace operator remarked, and very aptly so, 'Give me a furnace of workable design, one easy to manipulate, with good electrical characteristics, and I will show you a furnace that will pay handsome dividends.'" From this, as well as from Mr. Rehder's experience, we bespeak for the electric furnace a successful career.

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A 17-FT. CAST IRON FLY WHEEL

By F. C. P.

The accompanying illustration shows a 17-ft. cast iron fly wheel for an electric motor driven rolling mill as constructed at the West Homestead Mesta Works near Pittsburgh, Pa. This specially designed fly wheel, running two miles per minute is made of cast iron sections bolted together as indicated in the photograph. As it runs at a rim speed of 10,000 feet per minute, the wheel is made of air furnace cast iron, which has a much higher tensile strength than ordinary cupola iron to withstand the forces of this high speed.

17-FT. CAST IRON FLYWHEEL

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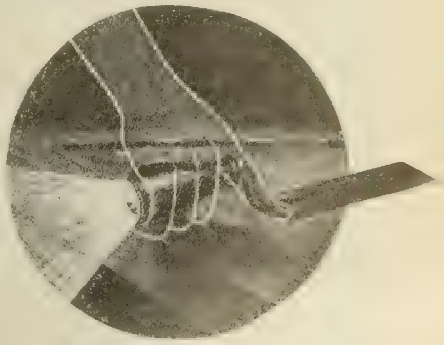
AN ILLUMINATED TROWEL HANDLE

"Popular Science Monthly" tells of a molder, Thomas A. Gatten by name, who was bothered by the partial darkness of the foundry, and not being able to get sufficient light to see down into his work, even with the aid of a hand mirror, he thought: "Why not illuminate the mold by electricity?" He set to work and invented a little electric lamp and battery to be sunk into the handle of his trowel, that would furnish light where and when it was needed, by the simple pressure of his little finger. The trowel is not altered in any way as regards its regular occupation, but has in addition, this little bull's eye to throw light into the darkness without the trouble of even reaching after a lamp.



ILLUMINATED TROWEL HANDLE

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Mr. P. D. Gordon, President of the Montreal Lumber Association, was again elected to that office at the annual meeting held in Montreal last week.

Core-Room of T. H. Symington Co., Rochester

Description of a New Core Room Building at Rochester, N.Y., Showing the Advantages of Good Ventilation and Lighting in Handling Supplies

By DONALD S. BARROWS

THE T. H. Symington Co. has recently placed a new coreroom building in operation at its malleable iron plant at Rochester, N. Y., of which Figs. 1, 2, 3 and 4 show respectively an outside view, first floor plan, basement plan and cross section. The installation was designed to balance a melting capacity of approximately 50,000 tons per year, and comprises three batteries of eight ovens each. Each oven section accommodates two core racks 5 feet square and seven shelves high. Each battery of ovens is provided with a firebox in the basement, thus avoiding the handling of fuel and ashes in the coreroom proper.

From Fig. 4 it will be noted that sand and coke are delivered on the elevated standard gauge track over the material bins at the left. Fig. 3 shows the arrangement of narrow gauge track in the basement in connection with each storage bin. The oven fireboxes are designed primarily for the use of coke, and this is supplied from bin No. 6 by means of small steel charging cars which are also used for the removal of ashes. Sand is shoveled from the storage bins into small end dump cars, Figs. 5 and 6, each holding exactly one mixer batch. These cars empty into mixers placed below the basement floor level, the latter being arranged to dump by power on a belt conveyor from which in turn the mixed sand is emptied into the boot of a vertical bucket elevator. This elevator extends through the main floor of the coreroom and discharges into overhead hoppers approximately 29 feet above the floor level. This arrangement is shown in Fig. 7. From these hoppers the sand is emptied into steel cars similar to those used at the mixers, running on a suspended platform over the coremakers' benches. Each of the latter is provided with a suitable spout and hopper to receive the sand.

How Cores are Handled

Empty core racks are placed conveniently to the coremakers' benches as core cars on a track system leading to the foundry. While a certain job is running, the core plates are left on the racks and the latter returned to a bench working on the same kind of core. The tracks leading to the foundry are shown in Fig. 2, one extending the full length of the molding floors on the west and the other on the east, so that cores can be delivered with the shortest possible carry. The main object sought in this layout was the continual movement of material across the building through the successive stages in the core-making process. The coreroom has been in operation a sufficient length of time to justify the arrangement of its equipment.

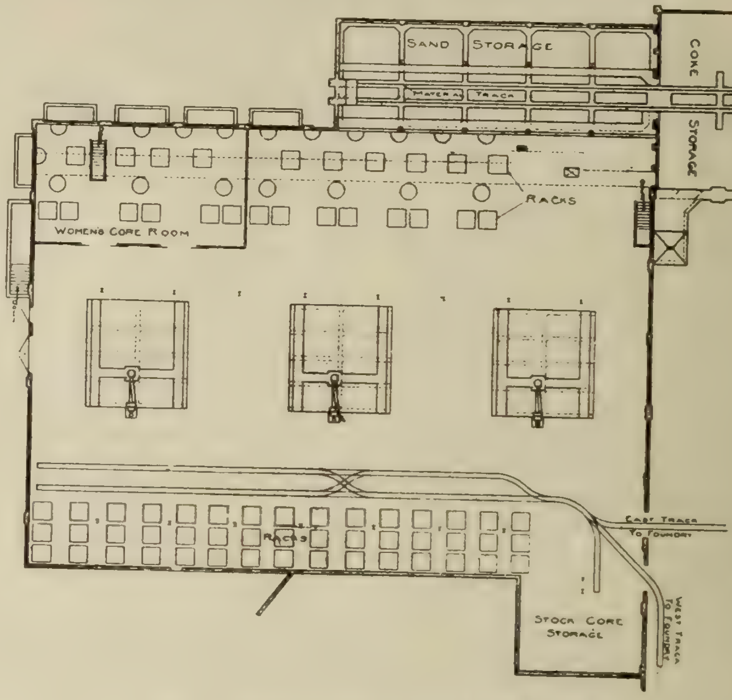

FIG. 2—FIRST FLOOR PLAN OF CORE ROOM

shown in Fig. 2 and these racks, when filled, are picked up and transported by an electric elevating truck to the ovens. After the cores are baked, the racks are removed from the ovens and placed along the other side of the building; the cores are then placed either on shelves under the leanto or directly on four-wheeled

In designing the building itself the principal object was the not unusual one of obtaining the most economical construction possible consistent with a permanent and serviceable structure, securing at the same time effective ventilation and lighting both by day and at night. The entire interior, including the steelwork, is painted white, and the absence of shadows and uniformity of lighting is shown by Fig. 8, The use of the Pond truss with continuous monitor sash, and with continuous sash for intakes along the east and west walls, has provided a system of ventilation which can be adjusted accurately to meet the existing weather conditions. Provision has been made for hoods over the oven doors with stacks leading through the monitor roof, but experience

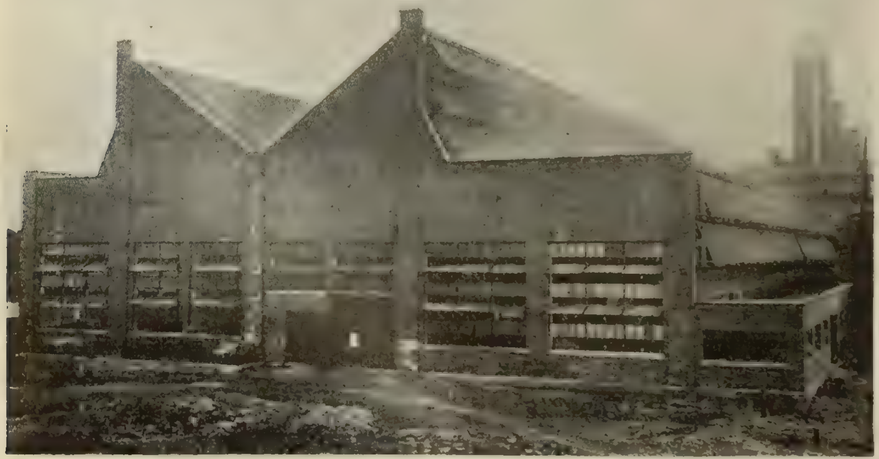

FIG. 1—OUTSIDE VIEW OF CORE ROOM BUILDING

with the building has shown them to be unnecessary.

To comply with the New York State laws it was necessary that that portion of the coreroom occupied by women operators should be in a separate enclosure from the ovens and this portion was therefore enclosed by hollow tile walls and a light reinforced concrete ceiling suspended from the trusses. A stairway leads from the women's coreroom to a rest room in the basement, connecting with a separate entrance at the foot of the outside stairs.

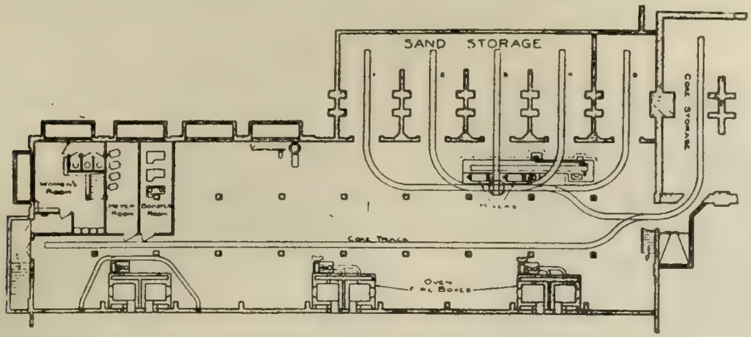

FIG. 3 - BASEMENT PLAN OF CORE ROOM

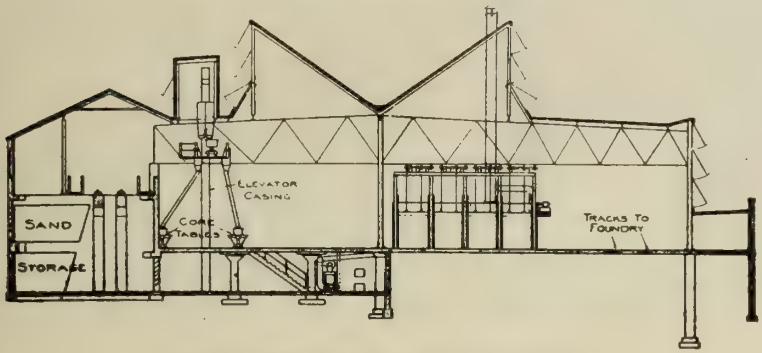

FIG. 4—CROSS-SECTION OF CORE ROOM

Type of Roof

The amount of steelwork in the building was reduced to the minimum by maintaining purlin and rafter spacing of about 10 feet, the roof slab being reinforced gypsum 4 inches thick poured in position. This type of roof was adopted because of its high insulating value and light weight. Theoretically a gypsum roof can be poured regardless of temperature as the material sets in about 20 minutes. This particular roof was applied in December and January of last winter and the difficulties encountered from the composition freezing to the forms and the inability to secure a smooth upper surface have satisfied us that a monolithic roof is not a winter proposition. The character of the upper surface made the waterproofing doubly difficult and required a considerable extra amount of pitch to fill in the depressions so that the felt could be applied.

The interior building columns and monitor struts are of H-beam section and the purlins are 12-inch channels for the flat roof and 12-inch I-beams for the main monitor. The Warren type of roof truss was adopted partly for the reason that it provides a clear opening at the suspended sand transfer platform and requires also a minimum amount of reinforcement for local bending moments at this point. The steel contractor was hampered considerably in the erection of his material by the severe winter.

The floor from the line of center columns to the west wall of the building is of concrete of 6-inch thickness laid on well-tamped earth fill, while from the center columns to the east building wall the floor is an 8-inch reinforced slab with intermediate reinforced concrete columns.

The sand bins are of reinforced concrete up to the track level,, including the track girders and piers. The sand bin track is a continuation of the existing material track in the adjoining foundry building, and this fact determined its location. The bins are designed to hold a three months' supply of core sand to carry through the worst part of the winter.

The rack type of ovens were designed and installed by the H. M. Lane Co., Detroit, which also furnished the detail designs of reinforced concrete work and co-operated with the Symington company in the general design of the building. The masonry and steel contracts were handled respectively by A. Friederich & Sons Co. and the Genesee Bridge Co., both of Rochester, and the gypsum roof was applied by the Aspromet Co., of Pittsburgh. The mixed sand conveyor and elevator was furnished by the Stephens-Adamson Mfg. Co., Pittsburgh, and the mixers are Blystone, with power dumping mechanism. The electric elevating truck is one of the standard sizes manufactured by the Automatic Transportation Co., Buffalo. For the grating over the mixer and conveyor pit the Irving grating was used and we have found that it is slip-proof regardless of the amount of oily sand which may adhere to it.

It was mentioned previously that the oven fireboxes are designed primarily for the use of coke. The ovens are also designed so that gas burners may later be applied, and one battery of eight ovens is now being operated with artificial gas, using thermostatic control. These ovens have not been operating long enough for us to come to a definite conclusion as to the relative economy of the two types of fuel, but it is expected that this will be determined shortly. It is our intention later to equip one battery with oil burners so that a threefold comparison may be made. The provision for

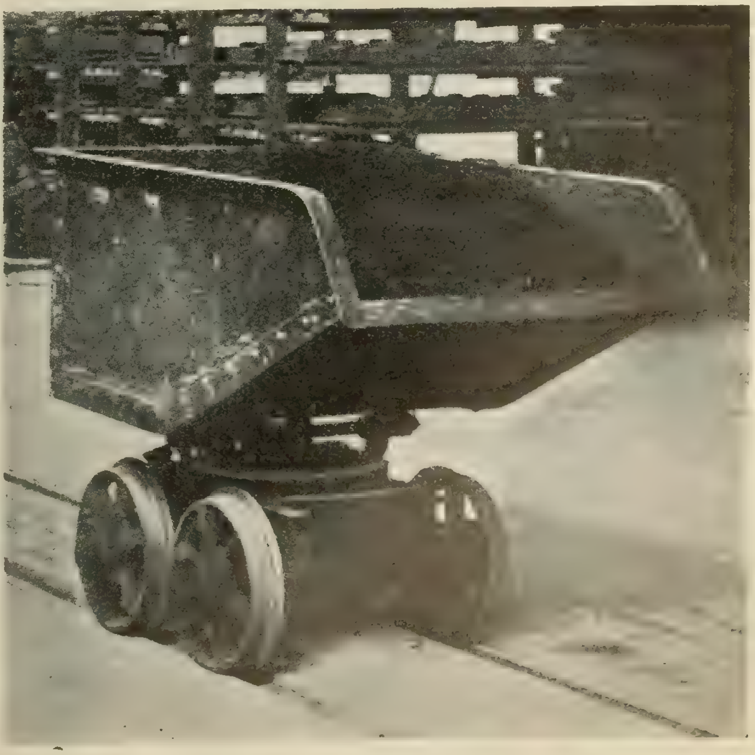

FIG. 5—DUMP CAR FOR HANDLING CORE SAND

possible use of any one of three fuels would seem to insure continued operation of the coreroom regardless of conditions which may arise in the fuel market.

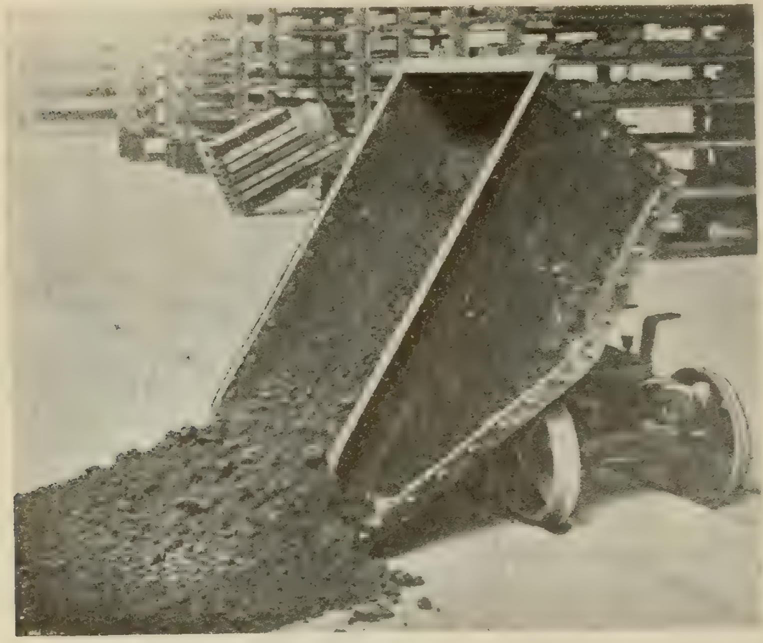

FIG. 6—ANOTHER VIEW OF DUMP CAR

PHYSICAL PROPERTIES OF METAL GROUND

A factor of importance to economy in the use of grinding wheels in the foundry is a knowledge of physical properties of the metal to be ground. To merely specify "a wheel is desired for malleable iron," may not be enough. This expression is sometimes used for annealed malleable and sometimes the white iron before it has been annealed. If the iron is of the annealed variety, alundum or an aluminous abrasive should be employed, but if the iron has not been annealed, by all means crystolon or some carbide of silicon abrasive should be used. The white iron casting usually require wheels of much greater hardness than the annealed castings, and the reason is clear when the difference in hardness, density and structure of these metals is known.

It is a common saying that the harder the metal the softer should be the grinding wheel. This aplies only to precision grinding, certainly not to the snagging of castings. Let us consider manganese steel, which, as everyone knows, can be machined economically only with abrasives. This material offers a high resistance to penetration, hence slightly finer grits are usually employed than would be used for ordinary carbon steel. Coarser grits would require more manual effort than could be expected from the ordinary workman.

Soft, stringy materials generally call for comparatively coarse grain and medium hard grades. Dense, brittle materials require slightly finer grain and harder grades.

The following examples illustrate this:

Metal—Manganese steel castings.
Grade—16-Q or R alundum vitrified.
Metal—Carbon steel castings.
Grade—10-U alundum vitrified.
Metal—Brass castings.
Grade—24-P or Q crystolon vitrified.
Metal—Chilled iron castings.
Grade—24-S, T or U crystolon vitrified.

It is no doubt well understood that the harder the fins and the sharper the contact,' the harder must be the grinding wheel. This is necessary to counteract the dressing and tearing action of the projecting metal.

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THE COAL SITUATION

HAMILTON.—Capt. George Guy, of the Gillies-Guy Coal Company, stated that his firm was in a position to supply all the soft coal needs in Hamilton. Mr. Guy stated that the matter of hard coal for home consumption would be a different matter, and that considerable difficulty would be experienced in getting a sufficient amount to supply the needs of the city. The Gillies-Guy Company some time ago made the statement to the Fuel Controller that if given a free hand they would supply all the coal demands for Hamilton, Brantford, Oakville and Grimsby, and that district lying within those points. This offer was refused by the fuel administration, Capt. Guy stated, but asserts that he has carried out the idea to a large degree. This is one of the biggest business enterprises and hardest contracts to be filled out that has come to light in some time. The very acute shortage of coal during the past year has been relieved by this firm only.

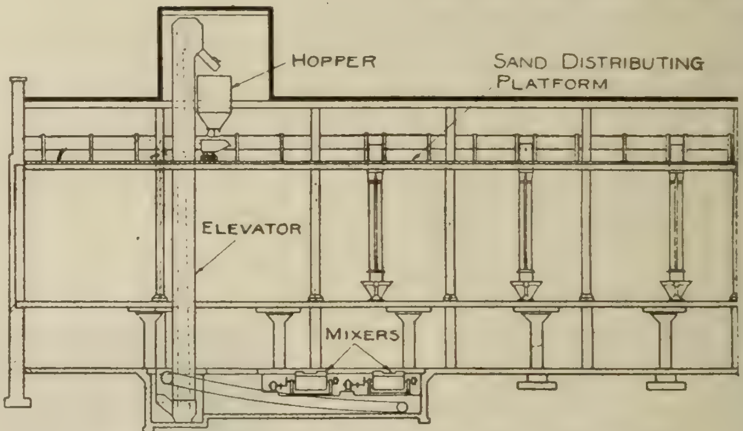

FIG. 7—ARRANGEMENT OF SAND HANDLING APPARATUS

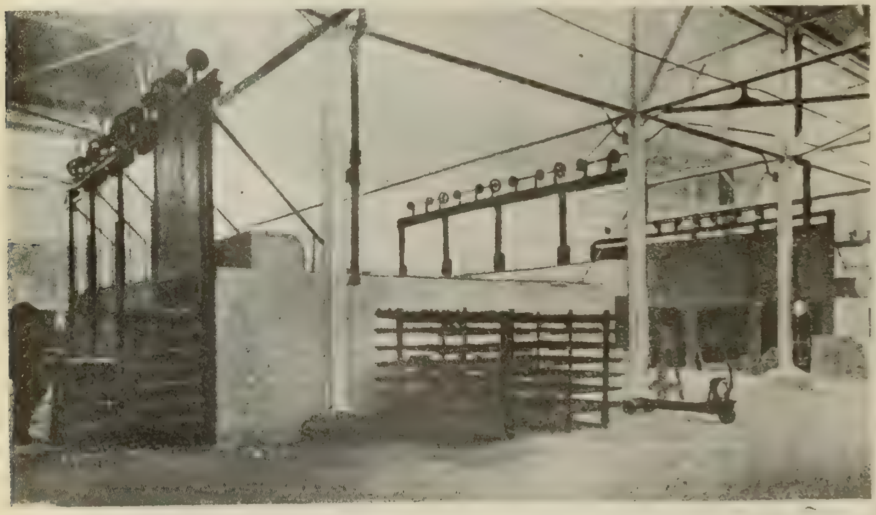

FIG. 8—INTERIOR OF CORE ROOM, SHOWING ABSENCE OF SHADOWS AND UNIFORMITY OF LIGHTING

The firm at the present moment stand to lose about $10,000 on coal orders that were taken during the summer months at the price which was then in

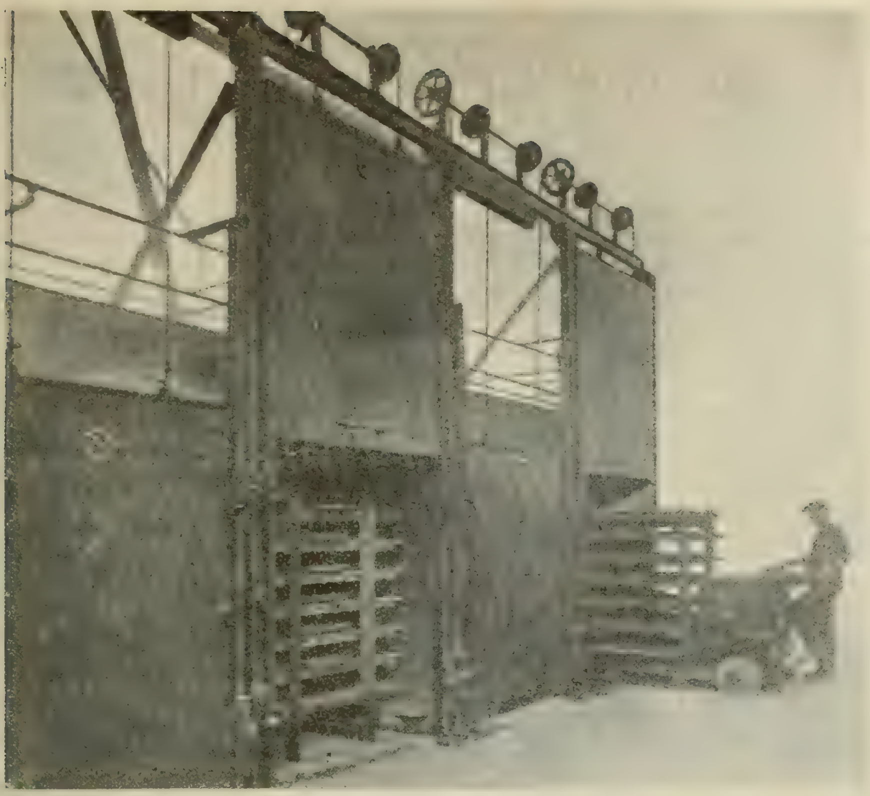

FIG. 9—ONE OF THE OVEN BATTERIES WITH ELECTRIC TRUCK HANDLING A LOADED CORE RACK

effect. The cost of coal, since the signing of peace, has advanced $1.05 per ton.

Captain Guy, who spends most of his time at the mines, has stated that the price of soft coal will drop considerably, but does not expect that any material reduction will be made in the cost of hard coal. According to his statement a number of wagon mines which have been producing an inferior quality of coal, and securing large prices for it, have gone out of business, as they cannot hope to continue to exhume coal when the prices drop to normal.

IMPORTANCE OF THE LABORATORY IN THE MODERN FOUNDRY

THE importance of scientific guidance in industrial pursuits has been very forcibly brought to the attention of almost every manufacturer in the past few years. Many industries have been compelled to pay the very strictest attention to the composition and physical properties of the materials entering into munitions of war.

The foundry has not escaped this general inquiry into ways and means of bettering plant processes, and while the semi-steel shell so far as America is concerned was only coming into its own the advice of French authorities may well be applied to foundry work in general.

General Camon and Lieut. Rouger in their investigation into the semi-steel as a material for shells made some very pertinent observations regarding the industrial laboratory. They found in an exhaustive inspection of foundries made in the latter part of 1915 and the first part of 1916 that a great variance was observed in the results obtained by the French founders. While some of them had a number of rejections of only 10 or 15 per cent. other foundries exceeded 50% rejections on the 155 mm. shell. These show that for the latter there were systematic errors in the latter places which should be investigated and eliminated.

For this reason it was advisable to sum up in a concise note the general principles which are at the basis of the development of semi-steel and to draw attention to the most important of these points. Since then the establishments had encountered new difficulties because the iron and cokes were no longer of as good a quality as those which had been used at first. Means had to be found to remedy this condition and different plants were communicated with as to the result of their studies in this connection. Some well known foundries had thought they could handle semi-steel as they had handled ordinary cast iron, by pure experiment. They had the troubles which they deserved, having been compelled either to abandon manufacture of semi-steel shells or to adopt, like their colleagues, methods based upon chemical analysis.

Obviously one could not fail to recognize the value of experience acquired in the course of long practice, but this experience must be associated with logical investigation.

Lacking laboratory analysis some manufacturers assumed that for each kind of piece to be cast the fusion bed or cupola mix, would be composed of definite proportions of iron marked as to its source and the appearance of the manufacture. Consequences resulting from this procedure were made apparent in—

First, the foundryman was at the mercy of certain producers; the lack of iron of a certain origin became the cause of embarrassment in the manufacture.

Second, the constituents of an iron of definite origin are always essentially variable, for they depend not only upon the ore but upon methods of manufacture. Even assuming an ore always of the same grade any mistake or accident in the operation of the blast furnace has its effect upon the chemical composition. These variations cannot be recorded with sufficient accuracy without the aid of the chemical laboratory.

Third, when a series of pieces is defective in quality of material it is more difficult without a laboratory to investigate and to remedy the cause.

Fourth, when the composition of the iron which should be obtained is definitely known fusion beds may be arranged, with the help of the laboratory, with materials at hand by varying their proportions.

By its very presence in the foundry the laboratory exerts a good effect upon the quality of the metal received; thus a Berlin foundry found after it had established a laboratory that a notable improvement resulted in the metal received, particularly as regards the sulphur content, the purveyors to avoid exposing themselves to a refusal on the part of the laboratory selected their product themselves and kept back sulphurous metal for the foundries which could not make analyses on reception.

To-day foundries working with semi-steel which do not have a laboratory and are satisfied with analyses made outside are exceptional in France.

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A negro was arraigned in a Memphis police court for aggravated assault, the fact being that he had hit another negro with a brickbat. After the attorneys had questioned the defendant, the judge took him in hand:

Judge: "Jim, why do you say you hit that other negro with a brickbat?"

Defendant: "Jedge, I hit 'im wid a brickbat 'cause he calls me a black, kinky-haired scoundrel. Warn't dat ernuf?"

Judge: "Jim, do you presume I would hit a man with a brickbat if he should call me a black, kinky-haired scoundrel?"

Defendant: "Cose you wouldn't, Jedge. But what if somebody called yer de perticler kind of a scoundrel what you really is?"

Practical Hints for the Brass Founder

ANTI-FRICTION AND OTHER ALLOYS

At the meeting of the Allied Metals Congress held at Milwaukee October 7-12, a very practical paper was presented by Mr. H. M. Warring, Altoona, Pa., on the subject of the anti-friction and other alloys that have been adopted by the Pennsylvania Railroad and outlined some of the methods evolved by this company to hold their tin consumption to a minimum. The approximate composition of the non-ferrous alloys in general use by this railroad follows:

	Copper	Tin	Lead	Zinc	Antimony	Phos.
Phosphorus bronze	79.70	10.00	9.50	....	....	0.80
Ex. b. bronze	76.75	8.00	15.00	....	....	0.25
Car journal bronze	75.00	5.00	16.00	3.00	....	1.00
Special high-lead bronze	70.00	5.00	25.00	....	....	....
Lining metal	.....	....	.....	....	13.00	....
Dandelion metal	.....	10.00	72.00	....	18.00	....
Bell metal	83.33	16.67	.....	....	....	....
Babbit tin-base ..	3.70	88.90	.....	....	7.40	....
Babbit for motor bearings	1.00	50.00	38.50	....	10.50	....

Phosphor bronze is used principally for rod bushings, main rod brasses and cross-head shoes.

Ex. B. Bronze is used to a small extent for backs of car and coach bearings, but the majority of these are now made of car journal bronze which contains on the average about 5 per cent. of tin.

Car journal bronze is used for making car and coach bearing backs, by melting down the old backs after removing the linings and making the necessary addition of new metal to bring the composition within the limits given above. No new tin is added in making this alloy.

Formerly the lead-base linings of car bearings was melted off and brought up to requirements by additions of new metal as required, but lately as this metal contains some tin, it has been used in making dandelion metal, thereby conserving the tin content. The lining metal is then made from new lead and antimony and contains no tin. Dandelion metal contains about 10 per cent. tin and is ued for lining cross-head shoes, engine truck and trailer bearings, hub liners and so forth, and its use has eliminated a large amount of tin-base babbitt.

Bell metal is used for locomotive bells, and during 1917 about 21 tons of this type of casting were made, involving the use of slightly above three and a half tons of tin.

The use of tin-base babbitt has been greatly restricted and every effort is being made to replace it with lead-base babbitt.

The amount of solder containing 50% tin and 50% lead was a big item, but the bulk of this has been changed to 40% tin and 60% lead, making a considerable saving in tin.

Another practical paper was presented by M. L. Lissberger on the subject of tin economy in solders. The method adopted by his firm in making solders is to first melt the lead, then add a flux and skim the dross, after which the tin is added. After this addition the bath of molten metal is stirred continuously for from five to six hours to thoroughly incorporate the metals, because if this is not done, trouble from segregation will ensue owing to the fact that tin and lead do not form alloys, but exist together as a mechanical mixture. It is therefore necessary to thoroughly break up the droplets of metal to enable those of the two metals to come into intimate contact and thus produce a more homogeneous mixture than is otherwise possible. This segregation is illustrated by what occurs when a block of solder one inch square and six inches high is cast. An analysis taken from the bottom will show 47 per cent. tin and 53 per cent. lead, and from the top 53 per cent. tin and 47 per cent. lead, when the metals have been thoroughly mixed. This illustrates why so much more tin than lead is lost in making solders by drossing. The alloy from which the above example is taken is composed of 50 per cent. tin and 50 per cent. lead. For solders used as a filling metal and not as a cement, tin can be conserved by using an alloy of 20 per cent. tin and 80 per cent. lead. For adhesive purposes and especially for food containers, a solder containing 40 per cent. tin and 60 per cent. lead can be recommended. For making solders, overheating must be avoided with the utmost care, otherwise much tin will be lost on account of the excessive dross that will be formed, and as this dross is always richer in tin than in lead, it will be evident that the alloy itself is impoverished in tin, and much of this metal is wasted unnecessarily.

An excellent solder consists of in 46 per cent. and lead 54 per cent., with a small amount of antimony, say about 0.25 per cent., which improves its appearance.

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CASTING IN ALUMINUM

By M. M.

The use of aluminum for castings which are not subject to great direct pressure is likely to increase, because of its lightness and its freedom from oxidization at atmospheric temperatures. It is of great value in aeroplane and submarine work especially, but it is not much used in a pure state. Where lightness and not strength is the chief consideration, alloys that have a very high percentage of aluminum are used, probably only about 1 to 7 per cent. of copper being added; but if toughness is essential and great tensile strength, aluminum bronze composed of 90 per cent. of copper and 10 per cent. of aluminum is good. This mixture is satisfactory for sea valves and small propellers, as it withstands the corroding influence of the sea water. What is called aluminum brass is really just an addition to a small percentage of aluminum to a copper and zinc mixture. It makes a tough alloy suitable for forging, but the percentage of aluminum is so small, probably 3 or 4 per cent., that it makes no appreciable difference to the weight of the casting. One great advantage of this mixture is that if a slight alteration is wanted in a casting the metal will draw out. For small bed plates, gear cases, and brackets, a very suitable alloy is 85 parts of aluminum to 11 parts of zinc and 4 parts of copper. It is true of all casting, but perhaps more especially of aluminum, that a great deal is found by trial, consequently mixtures are varied slightly to suit special classes of work.

Aluminum is a difficult metal to melt. It oxidizes readily, and the furnace temperatures should consequently be low. A gas or oil furnace is much better than the ordinary crucible fire. When it attains a dull red heat it should be poured. A flux is not necessary if care is exercised, but some common salt or zinc chloride may be used, the metal afterwards being stirred and skimmed. In mixing aluminum alloys for small work the copper should be melted first, and when it is fluid the aluminum may be added and stirred up with an iron rod. It is better, however, to add it as half aluminum, half copper, because the melting temperature of copper being so much higher—over 800 deg.—than aluminum, there is a danger of overheating. In making this mixing alloy the copper should be melted first and the aluminum added in small quantities. The alloy is heated first, and then the aluminum is added. Of course, if a zinc mixture is used, the zinc as usual is added last.

Much of the success in aluminum casting depends upon pouring the metal at the correct temperature. This can be determined by skimming the metal as it is melting. When it is right for pouring there will be no oxidization, and the surface will be clear. There is much disputing as to the effect of remelting aluminum alloy, and the results of experiments seem to show that a mixture which is rich in aluminum is generally improved by re-melting, but when the percentage of aluminum is small, its strength is reduced.

Care has to be taken when making molds for aluminum work that the ramming is not as hard as for ordinary gun-metal or brass castings. The shrinkage of aluminum is considerable, and if the sand is hard rammed, it will interfere with the free contraction of the metal, and distorted or cracked castings will be the result, otherwise there is not much difference then from ordinary brass founding. A good facing sand mixture is composed of one part of Mansfield sand to three parts of floor sand. For thin metal however, more floor sand should be used. It should be put through a fine riddle. French chalk or plumbago may be brushed over the mold, but occasionally a facing powder is dispensed with.

The cores for such molds should be well vented, as the metal is too light to force the gases out. An open sand is best, and sea sand is sometimes used with a strong binder.

Because of the shrinkage in such work, larger feeder heads are indispensable, especially if the metal is thick. As soon as the metal sets the casting should be stripped, and to facilitate this, some molders prefer wooden flasks, which are light, and thus easily handled. Apart from this advantage, however, although wooden flasks are very handy, as they can be quickly made, cast iron boxes are preferred by most molders.

COPPER AND IRON ALLOYS

The first conception of aluminum bronze was that of a copper and aluminum alloy which must contain the least possible amount of impurities. According to Brannt, great attention should be paid to the quality of the copper, as such impurities as iron were claimed by him to impair the quality of the bronze. He also stated that an aluminum with as small a percentage of iron as possible should be used, but the silicon in commercial aluminum was not so harmful, although it did harden the bronze considerably and increased its tensile strength. Modern research has shown the facts in the case to be materially different. Iron, instead of being injurious, is more beneficial than any other known element, and least injurious when used in quantity, but the aluminum should be as free from silicon as possible. The theory that iron is harmful to aluminum bronze has probably retarded the discovery, and consequent utilization of aluminum and copper alloys, and has stood in the way of the commercial development of aluminum bronze for many years. The idea, no doubt, was largely based on the prejudice of all brass founders against iron, due to the fact that iron fails to remain in solution with the copper-tin series of alloys, or with copper, zinc, tin, and lead mixtures, but segregates in the form of intensely hard nodules of steel. This segregation of iron in certain copper alloys is probably due to the absorption of carbon by the iron, and to the fact that it is too tightly held to be easily separated therefrom. Copper has no such affinity for carbon as iron has, therefore it is unable to assimilate the combination of iron and carbon, and possesses no power to separate them, the consequence is that iron carbide, having no affinity for copper, and possessing a higher melting point, separates as small pellets scattered throughout the copper or copper alloy, thus causing trouble. If it were possible to have iron free from carbon, it would alloy with copper at the proper temperature, but if ordinary cast iron is mixed with copper, no matter how vigorously the mass is stirred, the metals will separate upon solidification, the carbon being the disturbing element. If brass chips are melted, and any iron or steel is contained and has not been removed by magnet or otherwise, it will form into nodules, which will be found in the castings. Aluminum freely alloys with copper in all proportions; it will also alloy with iron, and when added to a liquid mixture of iron and copper it will cause the two to combine, regardless of the presence of carbon. It is immaterial whether wrought or cast iron is used in making aluminum bronzes containing iron, because, after the aluminum has been added the carbon will be ejected from the iron. Wrought iron is probably more convenient to use than cast iron because little, if any, allowance need be made for loss due to ejected impurities. When cast iron is used, the carbon is ejected by the aluminum and floats to the surface of the molten alloy as a finely divided flocculent mass, which can be skimmed off. It is necessary to use more iron in order to make up this loss. If the iron and copper are melted together and the aluminum is added in small pieces after each addition, a certain amount of carbon is ejected from the mixture, but if the metal is skimmed off each time, the quantity of ejected carbon grows less until it is all eliminated.

There appears to be a definite ratio between the weight of the cast iron and the amount of aluminum necessary to eliminate the carbon. If 20 per cent. of cast iron were melted with 65 per cent. copper, it would require 15 per cent. aluminum to eliminate the carbon and produce a homogeneous alloy of copper, iron and aluminum. Once the carbon is gone there should be no difficulty in adding tin or zinc. The objections, therefore, that apply to the use of iron in ordinary brass or bronze do not apply to aluminum bronze; thus there is no good reason why these elements should not be alloyed together. The physical properties of the bronze are improved by small additions of iron, but larger amounts produce an entirely new and greatly superior class of alloy. The introduction of iron into the alloy of aluminum and copper favors more rapid solidification, as the rich iron compound first separates and forms a nucleus around which the crystals are built. The effect of iron is always to produce stronger, finer-grained metals, hence better alloys. A good alloy for heavy castings consists of copper 88 per cent.; aluminum 7 per cent., iron 3 per cent.; manganese 2 per cent. The manganese is most cheaply and conveniently added in the form of ferro-manganese, the amount of iron so added being deducted from the total iron. For small castings the following alloy is recommended: Copper 83 per cent.; iron 7 per cent.;

Questions and Answers

Question.—We are having trouble with pin holes in our bronze castings. Can you inform us how to avoid it?

Answer.—You are probably getting your metal too hot in melting. Copper alloys will not stand overheating. If you will send us your formula we can give you more definite information.

Question.—We would like to get the formula for an alloy which will be fairly hard, have practically no shrinkage, and as inexpensive as possible.

Answer.—An alloy that has a minimum shrinkage can be made by mixing 45 lbs. tin, 45 lbs. lead, 5 lbs. bismuth, and 5 lbs. antimony. This alloy, however, is expensive, therefore it may be necessary to use an alloy of normal shrinkage on account of the cost. Lead 75 per cent., antimony 15 per cent., and tin 10 per cent., is cheaper, and might answer your purpose. Tin and antimony are hardeners, while antimony does not shrink in cooling, and bismuth expands in cooling. With this knowledge you can probably figure out something suitable. aluminum 10 per cent. For brass founders who have not studied the nature of iron it might be well to explain that all iron contains carbon, and if introduced into copper it is the carbon which makes the trouble and not the iron, and the idea introduced in this paper is to use aluminum to expel the carbon, when the iron will readily mix with the copper and improve the alloy.

RENDERING CONCRETE-WEARING SURFACES NON-SLIPPING

Floor surfaces are usually rendered non-slipping by means of grooving, and many other forms of indentation, usually made by means of metal stamps or brass rollers, having studs or channels on their revolving surfaces. There are, however, occasions when these expedients are not possible, and it is then that the use of emery can be put to good advantage.

Emery is manufactured in various grades, but that known as flour emery is principally used for concrete steps and landings, while a granular form is used chiefly for gradient concrete surfaces.

It is quite unnecessary and wasteful to mix emery throughout the whole thickness of the concrete. Such surfaces are usually topped with at least one inch of granolithic concrete, through which the emery flour or coarser-grained emery is mixed. Steps, for the sake of appearance, are usually trowelled smooth; other surfaces may be left from the straightedge, although, should the occasion arise, granular emery may be sprinkled over the soft concrete surface, and slightly pressed in flush with trowel or handfloat. One pound of emery flour mixed with two parts granite, half pail of granite-sand, and one of cement, mixed thoroughly in the dry state before wetting, will, in an ordinary case, be successful.—M. E.

Reclaiming Wealth in the Foundry Yard

Very Often a Person Gets His Impressions of Foundry and Other Work From the Wrong Angle—There's Money in Looking Carefully After the Scrap Heap of the Foundry

By F. B. HICKS

THE exterior appearance of a modern manufacturing plant, with its fine office buildings and well kept lawns and boulevards, together with the noise and rumble of the machines on the inside, are familiar sights and sounds to the regular passerby on many of our urban streets, but little thought does he give, and little does it concern him what transpires within the walls. To the stranger in town, particularly from the rural districts, it offers more attraction. He is used to seeing the powerful traction engine driving the grain separator, and he probably has given some study along the line of how they are built. He has a general idea of how intricate shaped molds are made, and how iron is melted and poured like water into these molds, and he pictures in his mind how the castings are machined and put into the proper condition to fulfil their proper functions, and he naturally has a desire to see it all when an opportunity offers. To start from the piles of raw material such as coke and iron and molding sand, etc., and see the job to completion would be interesting, but unfortunately he sees it from the wrong end to be favorably impressed. He is usually shown the finished machine standing in the show room, and then works his way back to the iron and coal piles. On being ushered through the plant he perforce reflects on the clean and tidy appearance of the machine shop with its windows all glistening, and its scavenger going his rounds with broom and shovel and barrow, all indicating an atmosphere of comfort and a feeling of pride on the part of those who have it in charge. Similar sights greet his eye in the other departments through which he passes, until he finally reaches the foundry, where the intricate molds are made and the molten metal is poured into them. Here things begin to take a decided change for the worse. Of course it is fascinating; so much so that he overlooks its appearance, and besides, he realizes that the nature of the work forbids keeping things looking trim, but the sight of some of the outer buildings and the yards are, as a rule, worthy of comment. This is not exactly anyone's fault, it is simply the rule of business. Nobody ever thought of cleaning up the foundry yard, it would only get dirty again.

Recovering the Metal

If the melter encounters a piece of pig or scrap which he cannot break, he just pitches it aside, or if it is too cumbersome he lets it lie where it is. He is told to not use scrap with bolts in, or scrap containing babbitt metal or brass, and to not use hard scrap, and so on; we might continue to enumerate the reasons why he leaves things undone. No place has been provided to put these things, and no one has time to do anything with them, anyway, and so they remain.

When H. E. McIntyre, the superintendent of the Sawyer-Massey works, came to take charge of their foundry in Hamilton a few months ago, this is exactly the condition of things with which he was confronted.

Here was one of the most up-to-date, progressive institutions in the country, buying nothing but the best of material, employing the best of men, and turning out goods of the highest quality; in fact, doing things right. Yet here is what Mr. McIntyre found awaiting him. The scrap iron yard was as described, several big castings, each weighing some three or four hundredweight, and shaped like air chambers, had refused to be broken. It was decided that they did not require breaking, so they were taken up the hoist and stood on end in the cupola, with the result that they are out of the way, and the Sawyer-Massey Co. are several dollars to the good in the bargain.

H. E. McINTYRE.
Foundry Supt., Sawyer & Massey Works

Among the relics in the scrap were several horse power bull wheels, bequeathed from the days when threshing was done with horses. These wheels contained tons of first-class iron, with only one obstacle in the way. A steel band had been shrunk around the outside; two men with a diamond-pointed set cut these bands in ten minutes, and secured 88 pounds of steel from each one, leaving the balance easily smashed.

As we have said, the shop was supplied with everything in the way of modern equipment, and of course this includes wet rumblers for separating the good metal from the drop of the cupola and from the "mash." The metal recovered from this source is not as soft as No. 1 pig, and was not considered safe to use, as a consequence mountains of it were on hand. "Couldn't be used" was the only reply regarding it.

By carefully weighing the charges so as to keep this metal from the light work, as much as 40 per cent. of this shot iron was utilized in casting 3,000-lb. pieces, producing a grade of metal superior to soft pig, for castings such as rollers. Tons of discarded crusher plates such as are used in stone crushers were in evidence. These plates are necessarily hard, being made from charcoal pig, low in silicon, but otherwise of the strongest and cleanest of metal. By melting them along with 15 per cent. ferro-silicon, the resultant castings could be made to analyze whatever was required. In smashing up the scrap which had been put aside, "until some other time," 262 lbs. of babbitt metal were recovered. This babbitt was analyzed and found to contain a higher percentage of tin than is being used lately. One cylindrical shaped piece of scrap, 5 feet long and 8 inch bore, was lined with half-inch thickness of babbitt metal. This casting was placed under the cupola and the bottom dropped on it, with the result that the babbitt was melted and run out of the end into a place provided for it and saved.. The casting was also in a shape to be turned into cash. When we consider that the company paid for all of this and that it was drawing no interest, and showed small likelihood of the principal being returned, it will be easy to appreciate the financial gain this is to the company at a time like this, when material of all kinds is of such consideration. But the greatest surprises in this connection were inside the doors. This shop has a space set aside for making brass castings, and one brass molder is employed. He keeps his department neat and tidy, yet on cleaning up this corner, Mr. McIntyre, succeeded in recovering 300 lbs. of good brass. A still greater eye-opener was in store in connection with the office. Piles of discarded copper plates, such as are used in printing advertisements were located. These plates were of different ages, and made by different institutions. Some were mostly copper, while others were thin copper faced. They were put in the melting pot and heated to a degree sufficiently high to melt the lead, when 278 lbs. of pure lead were poured into ingots, leaving 192 lbs. of copper to be melted and run into ingots. This metal was of the very purest quality, as nothing else is used for copper plates.

Sure of Analysis

We might say in conclusion that the

Sawyer-Massey Co. does not sell a pound of casting without knowing its chemical analysis as well as its physical properties, and the scrap unearthed by Mr. McIntyre was found to be superior to the average iron which is on the market to-day. The material, such as babbitt, would of course be sold to dealers; this company using nothing but standard grades.

The lessons to be learned from Mr. McIntyre's experience should be an incentive to other foundrymen to do likewise. Believing in the adage that "Cleanliness is next to Godliness," and endeavoring to make the place look as near "Godly" as possible, he succeeded in adding a handsome sum to the treasury of the company, as well as relieving to some extent the stress caused through shortage of just such material as he has been recovering. This material may never again be as valuable as it is today, and it behooves the wide-awake business man to look around and see what he has lying idle.

MIRACLES IN THE FOUNDRY

In the magazine, "English Mechanics and World of Science," we read the following in answer to an article in a former number on the subject of "Iron, Solid and Fluid," by a Mr. May.

Mr. May states that molten cast iron contracts in cooling to the solid condition, yet he also stated that solid cast iron floats on molten cast iron. The two statements are self-contradictory and cannot both be correct unless we invoke a miracle. Surely someone really versed in the matter should be able to make the matter clear. I feel pretty certain that the explanation is similar to that for water and ice, and that the particular kind of solid cast iron which floats will be found to expand on cooling from the molten to the solid condition.

(Signed) C. T. Whitehead.

Could some Canadian reader explain this phenomenon? We cannot agree with Mr. Whitehead that the iron expands in cooling, but we can agree that it is a mystery. We know that iron contracts in cooling and that a cubic inch of melted will be less than a cubic inch when solid. From this we may know that a given volume of solid iron is heavier than the same volume of melted iron. Why then does solid iron float on top of melted iron? Can anybody explain it, or is it a miracle?

A USEFUL CU-FE-ZN HIGH TEMPERATURE BRONZE

By M. Mark.

It is fairly well known that pure iron and copper will alloy together in almost any proportion, and it is also fairly well known that aluminum will alloy with both iron and copper in the absence of carbon, and while it also acts as a flux for both metals, a boron derivative has better effect. It is also fairly well known that bronzes which hold iron resist corrosion well, provided the iron is alloyed with the copper and is not a mere mechanical mixture. Zinc and tin will alloy with both iron and copper, provided there is no carbon present in the iron but in the presence of carbon, or when the iron is unskimmed and covered with dirt, trouble arises in practical working.

Absolutely pure, carbon-free iron is, of course, not commercially obtainable, but very fair samples can be had in the form of Swedish bars of some brands, some forms of boiler plates, and some brands of mild steel, the amount of carbon held both in the combined and graphitic states being extremely low, and while this in itself is a disadvantage it does not prevent alloying with copper up to perhaps 30 per cent. iron to 70 per cent. copper, where care is taken, and indeed, with many practical tests alloys that would roll well and also draw into tubes were produced with a content up to 20 per cent. iron, but above this there appeared to be trouble.

In all cases the procedure was to melt the iron, add somewhere up to 25 per cent. carbon-free ferro-aluminum to the iron, and when reaction practically ceased, the dirt was skimmed, and the copper heated to redness, put in and melted, the zinc made as hot as possible, being finally added, and then after stirring and skimming the metal was poured into ordinary sand moulds or metal ingot moulds as the case may be, the metal moulds being thickly lime-washed and dried prior to the molten metal being poured into them. In these cases, Swedish iron of the best quality was used, and for this reason the aluminum was low, but with some broiler plate punchings and other scrap irons of less purity up to 0.30 per cent. of aluminum was necessary, this necessitating a much larger percentage of ferro-aluminum. In any case, the amount necessary to secure the best results would have to be determined in the laboratory; but a small excess of aluminum would not matter, although it would increase the cost of the alloy. In every instance the exact composition of the alloy must be determined by practical trial to secure the best results in regard to the articles for which it is used, this being a very essential point, because not only do the metals used vary in content, but different degrees of hardness and strength are desirable under varying circumstances.

As the melting point of wrought iron is high, probably in most cases forced draught will be necessary in the furnaces, which, for the sake of economy, should hold four 75-lb. crucibles of the upright or barrel type, but of course, single pot furnaces can be used. In any case, from 2750° F. to 2975° F. must be secured or the iron will not melt readily, and where a somewhat higher temperature can be managed all the better; but this implies about the maximum refractoriness in both furnace linings and crucibles. Usually it takes about two hours to melt iron in a good furnace, while in a bad one it may take much longer, or the iron may even refuse to melt.

The crucibles should be of clay—in which case they only stand one day's work—or of plumbago with clay liners, as made by the Morgan Crucible Company, to take one instance; in either case the cost for crucibles being much higher than for ordinary bronze; but even at this the cost of the Cu-Fe-Zn alloy works out at very much less than the ordinary Cu-Zn bronze, when all costs are taken on a pre-war basis.

It must be particularly insisted on that the absence of carbon is the crucial point, but conjointly with this silicon must also be absent or the iron or alloy will absorb carbon and soon become a mere mechanical mixture of metals of more or less—generally less—perfect combination, which are liable to dissociate at very small provocation. In the experimental work carried out by the writer, both in regard to this alloy and to "Mitia" iron castings, it appeared that while a small percentage of combined carbon was not seriously objectionable so far as untested apparent effect was concerned, the presence of even 0.25 per cent. of graphite carbon had a very prejudicial effect, and in cases where grey cast iron was used in part or whole substitution of the wrought iron, a very imperfect mechanical alloy was secured in which the iron floated, and this quite independently of the presence of either tin or zinc or both combined. The only way by which a good mechanical alloy of copper and cast iron was produced was by the addition of aluminum in sufficient quantity to (on paper) make the specific gravity of the Cu-Al combination equal to that of the iron. In each case the trials were of a practical commercial character, not less than 56 pounds of the alloy being made at each operation.

There are no patents in force for the making of the bronze alloy mentioned, "Mitza" malleable wrought iron, or artificial "Monel" metal, which is an alloy of nickel, copper and iron, and the only real difficulty in making these things is the high heat necessary and the absence of carbon in the metal. Good alloying skill is, of course, a necessity, but this, of all things, must be taken for granted as a general thing.

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A typical charge used for crucible steel is as follows: Pig iron, 20 pounds; scrap cast and runners, 40 pounds; scrap mild steel, 100 pounds. The composition of the steel produced by the crucible method depends largely upon the average composition of the charge. The metal, however, absorbs carbon from the crucible and the carbon content of the steel always increases from 0.2 to 0.6 per cent. during the melting.

◆

Paddy Doolan went into a shop to buy eggs.

"What are eggs to-day?"

"Eggs are eggs to-day, Paddy," replied the shopman, looking triumphantly at two or three customers who happened to be in the shop.

"Faith, I'm glad to hear you say so," replied Paddy, "for the last ones I got here were chickens."

The Mixing and Melting of Cast Iron

The Success of the Foundry Depends More on the Proper Management of the Furnace Than on Any Other Branch of the Trade

By J. F. MULLAN

SINCE the outbreak of the war the demand for iron has steadily increased to such an extent that the supply has run far short of the demand, with the consequent result that foundrymen have been forced to use iron which was not suited to their requirements. Tons of castings have been scrapped because the iron of which they were made was not up to the required standard. What then has been lacking in the iron to bring it up to this standard? We know that the term cast iron does not mean pure iron. Cast iron consists of about 93% pure iron and the balance is made up of other elements in varying proportions. The elements which make up this balance are chiefly silicon, sulphur, phosphorus, manganese and carbon.

In order that the progressive foundryman may clearly comprehend the remarkable influence which these few elements exert upon iron, it is necessary that he should realize at the outset that iron when pure is always the same, physically and chemically, no matter from whatever source it may be obtained, and that all of the multitudinous variations the commercial metal exhibits may be traced directly to the effects of combinations with these few elements. In its pure or nearly pure condition iron is an exceedingly ductile metal which may be forged and hammered, or rolled into very thin plates, ribbons or bars. Such bars may be bent double while cold, or tied into bow knots. The tensile strength is comparatively low, being approximately 50,000 pounds per square inch, and the metal melts at a temperature between 3,000 and 3,500 degrees Fah.

The addition of a very small amount, or less than one-half of 1 per cent., of carbon (whose melting point is so high it has never been determined) lowers the melting point several hundred degrees and converts the metal into what is known as "mild steel," changing many of its characteristics and greatly increasing its tensile strength.

The addition of 1 per cent. of carbon gives us high-grade carbon "tool steel," having tensile strength frequently of upwards of 150,000 pounds per square inch, and possessing other new and valuable properties.

By still further increasing the proportion of carbon the saturation point is passed and "cast iron" results therefrom. The tensile strength is again reduced and the melting point is still further lowered, the metal takes on entirely new characteristics and its chemical composition becomes more complex by reason of the creeping in of other elements for which iron possesses very strong affinities, viz., sulphur, manganese and phosphorus.

A careful study of these elements and their effect on the iron should make it an easy matter to regulate the mixture to suit any ordinary class of work, provided it is properly melted. Pig iron seldom contains any more manganese or phosphorus than is ordered, and the same might be said of the average scrap pile. An iron containing silicon 2.05, sulphur .07, phosphorus .60, manganese .40, combined carbon .32, graphite 3.52, will be as strong an iron as can reasonably be expected from common cast iron, and to secure this the iron before being melted should contain 2.20 silicon and .03 sulphur. As is a well known fact, the condition of the carbon depends upon the proportion of silicon. If the silicon is kept the same the carbon may be depended on to remain the same, providing the other elements remain constant. If it were possible to get iron without carbon, it would, on being melted, absorb enough carbon from the fuel to bring it up to the proportion it otherwise would have been. The secret of making clean, sound, strong castings is not entirely in the analysis of the iron purchased, but is in the manner in which it is melted. The theory that one pound of coke melts ten pounds of iron is the cause of the great bulk of all the trouble which foundrymen have to contend with in getting the required results from the cupola. Dr. Edward Kirk of Philadelphia, whose reputation as a cupola expert is worth considering, puts one to eight as a fair proportion and considers that less than this is the average. If it is desired to melt steel with the iron, it will be necessary to use still more fuel. As proof of this let us quote extracts from remarks of Mr. F. E. Hall, metallurgist and chemist for the American Radiator Company, regarding mixture for shell work. His main points were: "The semi-steel needs to be very fluid—smoking hot—and must not be in the least dull, because it must liberate its gases. and on account of the lower carbon, it has a greater tendency to become sluggish. It must be handled rapidly and must have a very high initial temperature. In order to get this it is necessary to handle the cupola more carefully. A little (note the word little) higher percentage of coke must be run, and the details of the cupola practice must be followed very closely. We are using a cupola lined to 66 inches and are using a 2,000-lb. iron charge and run a cake ratio of 1 to 6.4. But we must keep the iron hot." This does not look as though a good charge of coke is only in the way. It shows that a company doing business with a view to being successful, uses the amount of fuel required to melt the iron properly. It also shows that 1 to 6.4 is a (little) more than they use in melting ordinary cast iron for their regular line of work.

The conclusion to be arrived at is that if the metal is to be of the chemical analyses calculated on, and is to be free from sulphur spots, etc., it must be melted with sufficient fuel. It may cost more for fuel and it may cost more for cupola lining, but all of this can be paid for with small change, while the gains to be derived therefrom will be figured in dollars and hundreds of dollars. As regards the introduction of steel into the iron it might be explained that steel being almost pure iron and lacking in the elements which make up ordinary cast iron, the chemical content is entirely changed and a lower percentage of carbon in proportion to the silicon can be maintained, but sulphur will be the hardest to control and unless the metal is very fluid the sulphur gas will make trouble. As regards sulphur, it is absorbed from the fuel, and the faster the metal is melted the less sulphur will be absorbed. This can be proved by stopping the blast during the heat, and letting the iron lie on the coke, the iron will be higher in sulphur.

My own personal experience is that the hotter the fire and the faster the iron is melted, the better will be the results in every respect. It is not necessary to pour it while hot, but even in pouring I would rather have it too hot than not hot enough.

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LEAD AND COPPER ALLOY

Lead, in an alloy, with copper as a base, can not be said to be chemically alloyed. It is simply a mechanical mixture, but as a component part in a mixture for bearing metal it makes a decided improvement, in that it is one of the best of antifriction metals in itself, but is lacking in compressive strength to hold up the load. If copper, tin and lead are mixed together, the copper and tin will mix chemically, each losing its identity and making a homogeneous mixture, denser and harder than either the copper or tin, while the lead will retain its identity and simply mix thorough the other. If looked at through the microscope it will be easily identified, being held like water in a sponge. If this mixture is used as a bearing metal, the copper and tin alloy will hold up the load, and at the same time keep the lead from crushing out of shape. The lead being of a slippery nature makes it an easy running bearing. Care should be taken to not have it any hotter than is necessary, as the different metals are apt to become disintegrated before the casting is set.

New Uses for Boring Machine in Pattern Shop

With the Aid of Flat Bottom Forstner Bit Many Jobs Formerly Done by Hand Are Now Done in the Boring Machine

By JOHN A. McEWEN

MOST of us remember the time, in the early part of our apprenticeship, when we tried to pare out a bolt slot in a small pattern.

The brace and bit seemed to be the proper tools to use first, but usually the screw part of the bit split the wood and we had to try again, besides exercising more care.

I used to wonder if the heavy cutting, with mallet and gouge, could not have been done by machinery, but the ordinary machine bit has a habit of wanting to go right through when once it starts, besides, you cannot crowd the holes too closely together, and the small hole made by the screw part of the bit is also a disadvantage. Another job that made a lot of hand paring was a worm pattern, but it is different now. For quite a while we have been using a flat-bottomed bit, called a Forstner bit, in our boring machine, and it has saved many an hour. We now make worm patterns in the following manner: Fig. 1, showing the worm to be made; Fig. 2 shows the blank with the lines drawn, those shown dotted represent the thickness of the thread at the bottom, or in other words the space between the dotted lines must be opened up down to the bottom of the thread before the sides can be bevelled; Fig. 3 shows the pattern set up between supports on the vertical boring table, and a Forstner bit the same diameter as the space between the dotted lines is in the chuck.

The pattern is placed in the correct position with the bit set to bore the proper depth, and a series of holes are bored round the pattern. After the stock between the dotted lines has been all bored out it is easy to bevel the sides and finish the pattern.

Other uses for these bits will be found, and the fact that the bored holes can be overlapped enables us to use the boring machine as a router.

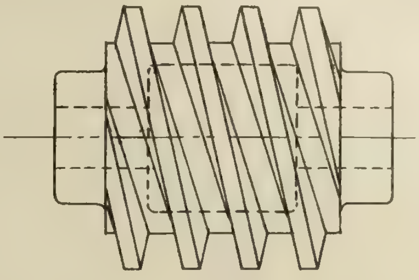

Fig. 1

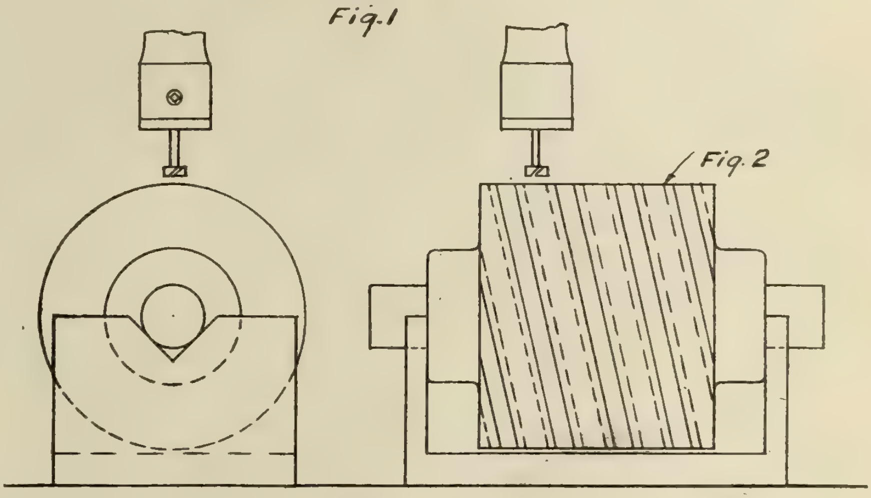

Fig. 3

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SAVE 106,000 TONS OF COAL

Four hundred experts have been appointed by the British coal controller to consult with and advise steam-power users how to eliminate waste. As the result of an inquiry by the Coal Control Technical Department, it is clear that a great deal of preventable waste of coal is going on. It will, however, take several years to recover the whole of this loss, even if a supreme effort is made by all the industrial firms, as it was impossible to instal more efficient plant during the war. Another cause of waste of coal is the employment of unskilled stokers, and, unfortunately, there are to-day perhaps more men of this description than at any other time, as so many skilled stokers have joined the army. There are 45,000 users of steam plant in Great Britain. Up to the present reports on 364 firms have been carefully scrutinized, and it is estimated that a saving of approximately 106,000 tons can be effected without any serious alteration to plant.

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URGES LABOR TO BE GUARDED IN ACTIONS

Tom Moore, president of the Trades and Labor Congress of Canada, has issued a letter to the trades unions, in which he announces the fact that the right-to-strike legislation of the Dominion Government has been repealed, and also intimates that a representative of labor has gone to the Old Country with Premier Borden to have some part in the peace conference. Regarding the conditions in the country, under these conditions, he says:

"It is to be hoped that, with the removal of these restrictions that the unrest caused amongst the members of our affiliated organizations will subside. The best judgment and efforts of all men will be required during the future months to avoid chaos during the readjustment period of this country.

"With the cessation of war and the discontinuance of munitions manufacturing, the possibility of serious unemployment faces us. As a temporary measure, requests have been made to the Minister of Labor that all government work be placed on an eight hour day, with the forty-four hour week, and an appeal issued to other employers to do the same in order that employment can be distributed between the greatest number of workers. Other measures such as the opening up of public works and the use of day labor thereon, eliminating the contractor, and making possible the use of all grades of unemployed labor, has also been suggested to the government."

◆

TOO MUCH SYSTEM

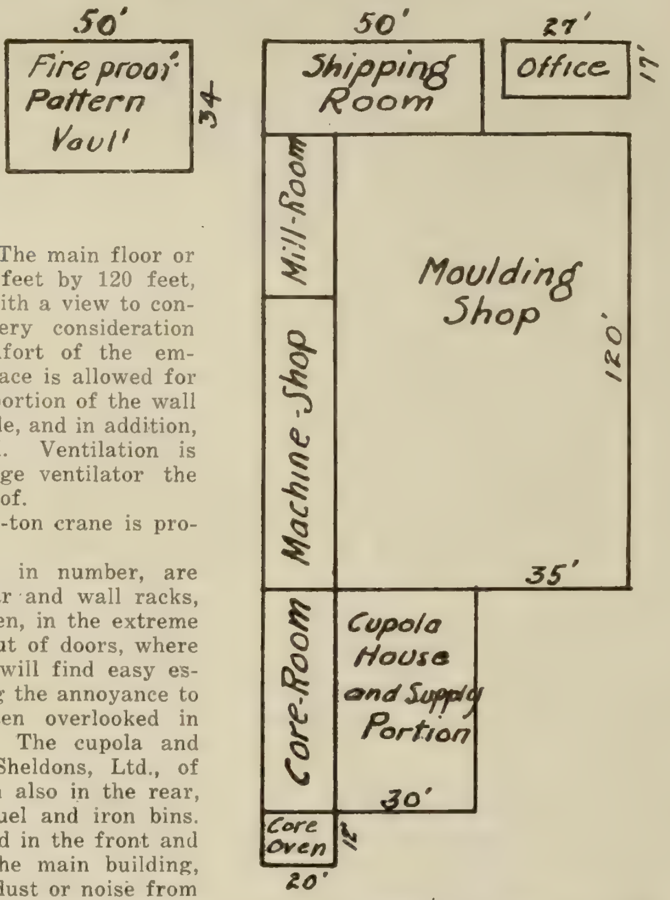
You can overdo everything. A Massachusetts manufacturer had to argue for some time before he could convince his works engineer that he was overdoing the thing in his enthusiasm in designing a conveyor for saving labor. To gain a slight labor-saving advantage this engineer wanted to project the conveyor in such a way that a part of the equipment would necessarily somewhat inconvenience the operators in getting to and from their line of machines.

The manufacturer was firm in insisting that all the gain in labor-saving was more than nullified by the mental attitude occasioned by frequently passing this nuisance obstruction.

NEW BUILDINGS OF THE HUGH PARK FOUNDRY OF OSHAWA

THE enormously-increased demand upon the Hugh Park Foundry of Oshawa for castings has necessitated the erection of their new and commodious structure, now nearing completion; the ground floor plan of which is shown in the accompanying illustration.

The entire structure is of solid brick and one storey high. The main floor or foundry proper is 65 feet by 120 feet, and is built not only with a view to convenience but with every consideration for the health and comfort of the employees. Abundant space is allowed for windows in whatever portion of the wall is exposed to the outside, and in addition, skylights are provided. Ventilation is assured through a large ventilator the entire length of the roof.



PLAN OF NEW BUILDINGS OF THE HUGH PARK FOUNDRY, OSHAWA

For heavy work a 5-ton crane is provided.

The core-ovens, two in number, are each provided with car and wall racks, and are, as will be seen, in the extreme rear and practically out of doors, where all smoke and fumes will find easy escape, thereby obviating the annoyance to the workmen, too often overlooked in foundry construction. The cupola and blower, supplied by Sheldons, Ltd., of Galt, occupy a portion also in the rear, being convenient to fuel and iron bins. The offices are situated in the front and are separated from the main building, thereby avoiding any dust or noise from the workshop while being convenient to the shipping room, as well as the molding shop. The pattern vault, a fire-proof building, void of wall light but lighted and ventilated from the roof, is also placed at a safe distance, thereby insuring safety to the patterns. The grounds, one and a half acres in extent, provide ample room for future extensions. The company manufactures a line of general machinery and fine grey iron castings, dies, etc., and when installed in their new establishment, which they hope to occupy about the first of the New Year, will employ a staff of one hundred men.

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ESTIMATING PHOSPHORUS IN BRONZES

By M. A.

Bronze drillings, to the amount of from 0.5 grm. to 2 grm., are dissolved in a mixture of 20 c.c. strong nitric acid and 10 c.c. strong hydrochloric acid, or, if preferred, 60 c.c. nitric acid (specific gravity, 1.135), and 10 c.c. hydrochloric acid. The mixture is digested for some time without boiling, until most of the red fumes have been evolved. If the concentrated acids are used, the mixture is then diluted to about 70 c.c. The liquid is next cooled and 40 c.c. of ammonia (specific gravity, 0.96) added slowly, with constant shaking, followed by 35 c.c. of niromolybdate solution, and the whole shaken well for a few minutes.

The mixture is allowed to stand for one or two hours until the precipitate has settled out, when it is filtered, preferably on pulp, washed with water until free from acid, the filter and precipitate transferred back into the flask, excess of N-20 caustic soda run in from a burette, the whole well mixed and the excess of caustic soda titrated with N-20 sulphuric acid, using phenolphlathein as an indicator.

1. c.c. N-20 caustic soda = 0.00337% P. on 2 grm.

The method is based on the well-known volumetric method of estimating phosphorus in steel. It is best carried out in a 600 c.c. conical flask and a rubber stopper used in the final shaking.

Points

1. The digestion with acid must be long, to oxidize all the phosphorus, or results will be low.

2. Boiling or heating must not be too prolonged, or tin will be precipitated and will be difficult to redissolve.

A comparison of the method has been made with a gavimetric method, in which the tin oxide containing the phosphorus is mixed with Hepar mixture and fused. The resulting melt is dissolved in hot water, the solution acidified with a little hydrochloric acid, whereby the tin is precipitated.

The tin sulphide is allowed to settle, and is then filtered off, the filtrate being boiled to remove sulphuretted hydrogen; nitric acid is added and taken down to low bulk, and the phosphorus precipitated and estimated as magnesium pyrophosphate in the usual way.

The results obtained by the two methods on a number of commercial bronzes are given in the accompanying table along with the approximate composition of the bronzes.

Copper	Tin	Lead	Zinc	Iron	Phosphorus Gravimetric	Phosphorus Volumetric
88.32	2.56	8.08	0.11	0.24	0.45	0.42
88.30	2.59	8.06	0.11	0.24	0.39	0.41
88.59	10.63	....	0.06	....	0.80	0.81
88.57	10.65	0.02	0.14	....	1.43	1.40
88.92	10.00	....	0.18	....	0.76	0.74
77.31	10.30	10.45	0.10	....	1.45	1.44
88.95	2.07	8.24	0.16	....	0.44	0.42
93.73	6.07	....	....	....	0.17	0.18
89.60	2.41	7.76	....	....	0.39	0.37
88.59	10.14	....	....	....	1.24	1.22
88.58	10.37	0.06	0.88	....	0.011	0.010
78.05	8.76	12.48	0.24	....	0.43	0.44

◆

"What," cried the careful housewife, "you charge me $3 a bushel for these potatoes?"

"Yes, ma'am," answered the polite grocer, "that is the very lowest price we can sell them for."

"How is it that I can get them from Brown's for $2.90, then?"

"I cannot say, madam. Perhaps Mr. Brown has taken a fancy to you. He is a widower and you are beautiful. Unfortunately, I—— Yes'm, $3."

◆

The new minister was delivering his first sermon. The darkey janitor was a critical listener from a back corner of the church. The minister's sermon was eloquent, and his prayers seemed to cover the whole category of human wants.

After the service, one of the deacons asked the old darkey what he thought of the new minister. "Don't you think he offers up a good prayer, Joe?"

"Ah mos' suhtainly does, boss. Why, dat man axed de good Lo'd fo' things dat de odder preacher didn't even know He had."

Technical Journal Best Aid to Education

Stationary Engineering Becoming Highly Technical and Specialized Avocation With Increasing Prestige—The Technical Press is Recognized as the Best Means For Procuring Advancement Through Increased Knowledge

By S. BALMFIRTH, Engineer Sick Children's Hospital

IN these days of war, of coal shortage, and rumors of further shortage, the engineer is being called upon for increased efficiency as never before.

Coal, which two years ago was plentiful and fairly cheap, is now scarce, poor in quality (frequently) and high in price.

These conditions have resulted in a demand from manufacturers and governments for a more efficient and economical system of power generation. That is to say both manufacturers and governments are putting the question right up to the engineer as being the man most likely to produce the results required.

However the work of a steam engineer is not learned in a day, but is a long, tedious and very often painful process. The engineer, unlike most of the manual tradesmen, is never out of his apprenticeship. He is like a man rowing a boat upstream; if he stops rowing he drifts back. So it becomes every engineer worthy of the name to keep everlastingly at it. In fact in these days of progress and invention in every line of business, it is absolutely necessary that one devote a fair amount of time to learning the finer points of one's chosen line. Nowadays the up-to-date chief engineer is being classed, at least as a semi-professional man, which is only right for certainly steam engineering has got past the old rule-of-thumb days.

Time was when the fireman of to-day was the engineer of to-morrow. That is, the beginner in the steam engineering profession began as a fireman, and from the experience he got as such, and from his observation of what the engineer did and from what the engineer was willing to show him, he progressed slowly and laboriously until he had sufficient knowledge (or thought he had) to apply for a position as engineer. If he succeeded in getting a position as engineer, his troubles began. Then he found quite frequently that engineering was "not just what it's cracked up to be!" However, if he succeeded in keeping the wheels turning without having to call in outside help, in most cases he would be able to hold down the job long enough for him to learn more about his business.

Of recent years, however, in keeping with the general progress of education the engineer is fast coming into his own.

No longer is he known as "the man in greasy overalls carrying a monkey wrench," although both these articles are very necessary adjuncts, but he is being recognized as a very necessary and important man in any business, by the most prominent manufacturers.

It is not necessary for any engineer to depend entirely upon his own experience for his information. Nowadays there are books published for self education (some of which are suitable and some are not), correspondence schools, free libraries, night schools, engineers' associations and many other ways open to the seeker after knowledge.

The writer has used most of them, with varying success. Experience is, no doubt, the best teacher, but her course is very expensive. So it is very much less costly to use the other fellow's experience.

Any one can profit by his own mistakes, but it takes a wise man to profit by the mistakes of others. Of the sources of information mentioned above each has its good points, and each its disadvantages.

One of the disadvantages of the technical book, is generally speaking, it is not written for self education. It may be intended for that purpose, but very frequently falls far short of fulfilling its purpose. Many of them are couched in language entirely beyond the average engineer's education, and require a teacher to explain. Further, the best book written at once grows old and out of date the moment it is published.

Correspondence schools fill a great want in this regard, in that their text books are generally written for self instruction. Most of them are written in simple language, and carry the student along step by step from the first rudiments of the subject in hand to its final conclusion. Further the correspondence school saves the time required in travelling to and from home and school, and also makes use of any odd minutes that the student may have to spare. The writer put in a good many hours' study on the street cars.

Technical schools, that is evening classes, are an excellent means of providing higher technical education for the man who can attend. But right there is also the disadvantage. No course of lectures will benefit a man unless he can attend all, or at least the largest proportion of them, and the average plant engineer cannot be certain of being able to attend all lectures. Things have a habit of going wrong on class night, and one of the most important lectures is missed, and then the whole course is thrown up in disgust. Then again many engineers cannot attend by reason of the time of their watch, so that they have to forego the benefits of the night class.

Still for those who can attend the night technical school is an ideal means of acquiring an education; combining as it does the use of spare time with both practical and theoretical courses of study.

The engineers' association is a very good means of self improvement; in fact one of the best. If the association is at all alive, discussion of various subjects of interest to all engineers is the main part of the evening's business. Every one has a chance to express his opinion, and many and various are the opinions expressed at times. Still, by discussion one learns, and by friction a polish is given. So that even if one makes mistakes in giving expression to one's opinion, it is not often that one makes the same mistake twice. Then again a mistake made in discussion of any subject is much more easily rectified than a mistake made on the job; it is not likely to be so costly either. The older engineers are always ready to help the younger ones, by giving them the benefit of their experience.

But!——— if you wish to learn about any subject, write about it. One could safely say that what one writes about, one remembers best. Not only that, but what one writes about one generally takes care to be accurate.

So, the technical magazine has a field all its own. In it one can express one's opinion on any subject covered by the magazine. Not only that, but the criticism evoked is often constructive, in fact generally so. Further one can ask any question and be sure of geting an answer. There is generally someone who knows the answer to the question and is willing to pass the information along.

The technical magazine has one great point in its favor, that is, it is never out of date. One can always be sure of finding the latest improvements and the newest inventions in its pages. Then again the advertisements are a fruitful source of information of what is new and

Continued on page 309

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Vol. IX. DECEMBER, 1918 No. 12

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Russia and the Russians

SPEAKING of the foreigners as probable material to draw from for our future supply of molders brings up the question "Who are the foreigners?" Anyone who is not a Canadian might be considered as a foreigner in this country, and anyone who is not an American would be a foreigner in the United States, and so on, but that is not the generally accepted version. What is usually considered as a foreigner is the man from any country where the English language is not spoken, and among those frequently referred to as such are the Russians. Perhaps it is not generally known that the Russians have accomplished feats in metal working which would stagger the whole of us. Canadians are accustomed to look upon Great Britain and America and perhaps a few of the European nations as likely places to produce big things, but Russia would not likely be included in their imaginations, yet Russia has outdone them all. The heaviest iron casting which was ever made, was molded and cast in Russia and used in a Russian iron-working industry. Likewise, the heaviest brass or bronze casting, which the world ever knew was molded and cast in Russia and is still there. The polished sheet iron which is used for lagging locomotive and other boilers and which has to stand all kinds of inclement weather is made in Russia and has never been very seriously encroached upon by any of the other nations. This sheet iron, known the world over as "Russian Iron," is not rolled as is the custom in other countries, but is hammered to the required gauge. This closes the grain, in fact it removes all semblance of grain as well as leaving a finish on the surface which might almost be termed an enamel and is practically impervious to the rain. To hammer the iron into this condition and in such quantity as would be required to supply the world, ponderous anvil blocks have to be cast. One at least of these anvils weighed six hundred tons, and as would be expected, had to be cast with the face down, and afterwards turned over and put into proper position. This is a record casting, never approached by any other nation. Now about the brass foundry business. Russia has always been noted as a nation of churches and church bells, and the City of Moscow has more churches and bells than any other city of its size in the world. Some of these bells are of enormous proportions, but far outclassing all the others, is the Kremlin bell, perhaps more familiarly known as the "Great Bell of Moscow" and weighing 216 tons. This is undoubtedly the greatest bronze casting ever known, and it was successfully molded and cast in Russia 165 years ago. True it was a waste of energy and a waste of good material, but it demonstrates what Russians are capable of undertaking. In a minor way perhaps, yet of considerable importance, is "Licopodium." This material is the pioneer of partings to supplant parting sand in the foundry and it is a Russian product, being the pollen of the "club moss," which is grown and gathered in Russia. Perhaps it would be as well to take off our hats when we are conversing with the Russians on the subject of foundry work.

Other Big Castings

Speaking of big brass castings reverts one's thoughts back a few thousands of years, to some of the structural work which was done in those days. Nobody has ever accused the Jews of not being familiar with the handling of metal, but have we ever given thought to the job which Hiram had on his hands when he cast the two columns which stood in the front of Solomon's Temple?

First Kings, 7th chapter and 15th verse, says he "cast" two pillars of brass, of 18 cubits high apiece; and a line of twelve cubits did compass either of them about.

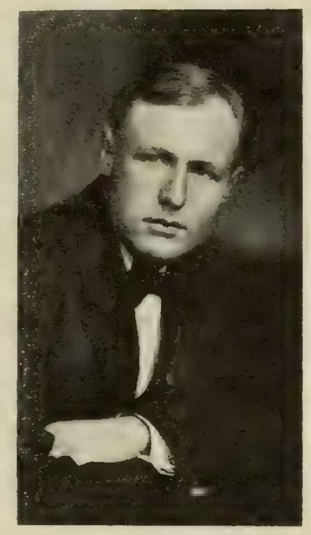
In "Works of Josephus," Book VIII., chapter III., verse 4, of "Antiquities of the Jews," we read: "Now Solomon sent for an artificer out of Tyre, whose name was Hiram; he was by birth of Napthali, on the mother's side (for she was of that tribe) but his father was Ur of the stock of the Israelites. This man was skilful in all sorts of work; but his chief skill lay in working in gold, in silver, and brass; by which were made all the mechanical works about the temple, according to the works of Solomon. Moreover, this Hiram made two (hollow) pillars, whose outsides were of brass; and the thickness of the brass was four fingers breadth, and the height of the pillars was eighteen cubits, and their circumference was twelve cubits, etc. According to different authorities a cubit is from 17½ to 22 inches, and a finger's breadth is .875 inches. If we accept 21 inches as a cubit and 3½ inches as 4 fingers, we will have a brass shaft of 31½ feet long, 21 feet in circumference, and 3½ inches thick, with a core 6 feet in diameter running the entire length.

Hiram was some brass founder all right.

STUDY AND TRADE PAPERS LEAD TO SUCCESS

Walter A. Janssen, Operating Manager Canadian Steel Foundries, Ltd., Montreal

WALTER A. JANSSEN, operating manager, Canadian Steel Foundries, Limited, Montreal, was born in Davenport, Iowa, and received his early education at Freeport, Ill. In 1907 he graduated from the University of Wisconsin in chemical engineering. His work as draftsman and later chemist prepared him for his position of superintendent of the open hearth department and then the Steel Foundry of the Bettendorf Company, from which position he accepted that of operating manager with his present firm. Mr. Janssen is single and resides at Freeman's Hotel, Montreal.



W. A. JANSSEN

"The value of study by young mechanics," stated Mr. Janssen, "can scarcely be over-estimated, and their training is a most important factor in the success of the country's industries. Trade papers are the great clearing house and connecting link which bridges the gap existing in manufacturing circles between the office and the working force, and their educational value is conducive to greater co-operation and advancement."

At the last annual meeting of the American Foundrymen's Association, held in Milwaukee, Mr. Janssen was elected vice-president.

OUR idea of explicit confidence is the youngster writing letters to Santa Claus or the wife who believes everything her husband tells her.

* * *

IS the government or the Food Controller afraid to tell the farmers that they must not chase the price of eggs up to a dollar a dozen? The squeeze is felt in the cities while the farmers run wild.

* * *

DON'T fool yourself. Your job's pretty much like your pocket. You'll get out of it just about as much as you put in. If you don't put much into it you're pretty sure to pull about that much out.

* * *

SOME folks are inclined to throw up their fists and say "Good land, what will we do when all the soldiers get back home?" Well, we were getting three meals a day before they ever went away. Some people are grouching so much about the soldiers coming back that one might suspect they were wishing the war might continue indefinitely.

* * *

A HAMILTON gentleman called at this office a couple of days ago. Discussing the money that some people had made out of the war, he thumped the pine table with his horny fist and said, "They have passed from pinching poverty to plutocratic prosperity." Shakespeare's double superlative, "the most unkindest thrust of all," hasn't much of an edge on that.

Speakin' of Meals

WHEN folks go in to get a meal at some big, smooth hotel, you'd think that half the eatin' there was done by lookin' swell. You prance upon a carpet floor and when you take a seat, 'bout sixteen waiters swoop around to hand you out a treat.

Why one galoot he gets a pail and pours you out a drink, another whisks a battin' card, 'twould make you gasp and blink—another gets a napkin out and ties it round your neck, you'd think you'd get your puddin' and yer soup served by the peck.

They put six knives a-side your plate, likewise six forks and spoons, they start the band a-tootin' at forty kinds of toons.

Old ham and egg, she's 80 cents, consomme 50 more, you clutch your seat to make her sure you're settin' on the floor.

By heck, there's silver dishes, there's folks a-bobbin' round, there's elegance jammed to the roof a-startin' from the ground. You're most a-scared to dig right in and stoke it as of yore, for fear you'll send the trappin's a-flyin' on the floor.

Ah, give to me the old-time meal, with just one set of tools, and cart away them boiled front doods and all the other fools. And let me saucer out my tea and eat pie with my knife, and do them other grand old tricks, they are the salt of life.

And let me have a kitchen fork to pick my hollow teeth, don't tempt me with the trinkets for fear I come to grief—them good old meals in good old ways is pleasin' night and noon, more so than sixteen waiters a-prancin' round the room.—ARK.

TECHNICAL JOURNAL BEST AID TO EDUCATION

Continued from page 307

what is standard and reliable, so that, generally speaking, the technical magazine may be made one of the best means of keeping up to date.

But to the engineer it may also be a source of revenue, besides being a general depot of information. If you have any experience that strikes you as being out of the ordinary, write to your magazine about it. If it's good enough to print, its good enough to pay for. It does not really matter if you never wrote for publication before, if the language you use is ungrammatical, or if your spelling is of an order not mentioned in "Webster's Unabridged"; send it in. The magazine has men whose special job it is to clothe your idea in suitable and proper language and fit it for presentation. If you can make a sketch to help illustrate your idea, all the better. It need not be a scale drawing or an artistic piece of work; if it expresses your idea, the artists on the staff of the magazine will make a good drawing of it.

Possibly a single instance may illustrate the idea. The writer had occasion to give a paper at one association meeting, which dealt with the writer's everyday work. The writer's opinion, when he began to prepare the paper, was that he knew sufficient about the subject to make preparation unnecessary. However, as the paper progressed the writer found that his knowledge of the subject was not quite so full as he thought, so he had to consult various works of reference, but by the time the paper was ready to present the writer knew what he talked about, and in the discussion which followed the paper the writer was able to answer every question and argument. Before the preparation of the paper the writer thought he knew, afterwards he did know. Writing about a subject impresses almost indelibly on the memory.

THE SNAGGING OF MALLEABLE IRON CASTINGS

By W. T. MONTAGUE

THE importance of the malleable iron industry and the rapid expansion noted in recent years makes the subject of grinding these castings well worth considering. It is a part of the wheel manufacturer's business to keep in touch with the tendencies and changes of foundry practice and in so doing a great deal of information has been obtained which may be of interest to many of our readers and of some small value to others.

Before considering the grinding of malleable iron castings, a brief statement of what constitutes malleable iron may be of value. A recent article by Mr. Henry F. Pope in "The Foundry," contributes much of our information.

Iron as it is run from the furnace and poured into the moulds in the process of making malleable iron castings is not malleable at all but extremely hard and brittle. When broken it presents a white fracture. But this brittle iron is of such a composition that when subjected to the proper annealing heat for the requisite length of time, it is transformed into an iron with entirely different physical properties.

After annealing the fracture shows black instead of silvery white and hence the name "black-heart" malleable iron, by which method about 95 per cent. of the American output is made.

The European practice produces a "white-heart" malleable iron due to a longer heat treatment in which the carbon is almost entirely removed by oxidation. This is only mentioned as a matter of interest and to call attention to the fact that grinding wheels of entirely different grains and grades are required to grind the European irons.

The black fracture of American iron is due to free carbon or graphite of noncrystalline form deposited between the molecules of the iron. The American practice is to pack the white iron castings with rusted rolling mill scale in annealing pots and heat for about sixty hours. The oxide or rust yields a portion of its oxygen to the metal which is decarbonized in consequence of the carbonic oxide given off. That is, some of the combined carbon is actually extracted from the castings, leaving the remainder as graphitic carbon surrounding the molecules of iron.

Physical Properties

The iron itself is left almost entirely free from any combination with carbon and hence it possesses the malleable quality of wrought iron. Good malleable iron has a tensile strength of from 40,000 to 50,000 pounds per square inch, with an 11 per cent. elongation in two inches.

Lack of uniformity has been one of the most serious shortcomings in malleable iron during recent years. But recently there has been a noticeable improvement which is quite remarkable considering the difficulties in getting suitable fuel and irons. According to Mr. Touceda, a consulting engineer of Albany, N.Y., a large number of tensile tests carried out on malleable iron showed that in 1914 72 per cent. of the samples tested exceeded 44,000 pounds per square inch; in 1915, 86 per cent., and in 1916, 89 per cent.

This change in physical properties tells the wheel manufacturer that he must expect a gradual change in the specifications of his grinding wheels.

We still have ample evidence that the physical properties of malleable iron vary at different foundries and hence the selection of the grinding wheel is largely a matter of experiment in each instance.

According to Mr. A. T. Jeffery, of the Dayton Malleable Iron Co., trouble is often encountered in machining malleable iron due to faulty heat-treatment, such as under annealing, cooling iron too quickly, burning the iron. These conditions do not affect the grinding action seriously, but might cause comment if not understood.

Uses of Malleable Iron

Malleable iron castings began to be used for parts of agricultural implements, wagon and harness hardware, stoves, pipe fittings and so forth. Later the railroads began to use it and more recently malleable iron has become popular in automobile construction.

Machines Used

The annealed white iron or malleable iron castings are usually ground on floor stands with 1½ inch or 2 inch spindles. Occasionally small castings are ground on bench stands mounting 10 inches or 12 inches diameter wheels, 1 inch to 1½ inch thick, with 1¼ inch hole. Also some of the heavier types of castings are more conveniently ground by means of swing frame grinding machines. In this case, 18 inch to 24 inch diameter wheels are used down to about 14 inches diameter, when they are transferred to floor stands for smaller castings, and thus used down to about 8 inches diameter.

Sizes and Shapes of Wheels

In a majority of cases straight wheels are used but we find quite a few bevelled wheels, tapered both sides ½ inch and ¾ inch per foot, in service. As it is usually possible to have the wheel guarded by a protection hood, there is no real reason for the use of the bevelled wheel. Such wheels cost more to make and command a higher price than a straight-sided wheel of the same diameter. They also require in manufacture a larger amount straight-sided wheels and this extravagance seems needless, especially when chaser if desired. As sent out, however, there is a growing necessity for maximum conservation of the abrasive supply of the country.

The following sizes are considered good practice on floorstands:

Diameter.	Thickness.	Diameter Arbor Hole.
14 in.	1½ in.-2 in.	1½ in.
16 in.	1½ in.-2 in. -2½ in.	1½ in.
18 in.	2 in. -2½ in.-3 in.	1¾ in.
20 in.	2 in. -2½ in.-3 in.	2 in.
24 in.	2 in. -2½ in.-3 in.	2 in.

Question of Abrasive

The surface, at least, of malleable cast iron is essentially a low carbon steel and has similar physical properties. Therefore,, this automatically determines that the proper abrasive is Alundum or some aluminous abrasive. This is oftentimes misunderstood and an attempt is made to use a carbide of silicon abrasive, such as Crystolon or Carborundum. The result is equally as unsatisfactory as trying to use Crystolon or Carborundum grinding wheels on steel castings. Use an aluminous abrasive on malleable iron castings.

Grain and Grade

Summarized first, we will say the following three types of wheels are most generally used on annealed castings:

24—Q Alundum Vitrified—for small automobile parts and miscellaneous castings up to 5 lbs. in weight.

20—R Alundum Vitrified—for miscellaneous castings from 5 lbs. to 25 lbs.

20—S Alundum Vitrified—for larger castings and castings with sharp fins and narrow edges.

However, these do not always answer the purpose as well as coarser or harder wheels. Where the contact is broad, or in general surfacing work, 16 and 20—Q will be found better adapted than the finer wheels. 16—R Alundum is also used in a number of instances and where a still harder wheel is required, 16—S Alundum, 10—T and U Alundum are found satisfactory on such work as differential housings, removing gates and fins from journal boxes and other heavy railroad castings, and in a few cases 10—W has to be employed. However, the use of such hard wheels is usually made necessary because of low operating speed or because of unusual methods of applying the work to the face of the wheel.

In general, we might say that the following three factors influence the size of grain to be used:

1. Size of fins and gates.
2. Rate of cutting required.
3. Surface desired.

Grade on the other hand is dependent upon

1. Contact between wheel and work.
2. Wheel speed.
3. Size of castings.
4. Method of applying work.

Grinding the Hard or White Iron Castings

White iron castings that have not been annealed are usually ground on double-end floor stands. The sizes and shapes of wheels correspond to those mentioned previously.

Abrasive

In the case of the unannealed iron, we have a dense brittle metal, the carbon being combined with the iron. It is hard from the standpoint of penetration but of low tensile strength. These conditions call for a carbide of silicon abrasive, such as Crystolon.

Grains and Grades

The grains employed on these hard castings range from 16 to 24 and the grades from R to U Crystolon vitrified. The wheel that is found most frequently to meet the conditions imposed by these castings is the 20—S Crystolon vitrified wheel, although for small castings up to five pounds in weight with light fins, 16—R Crystolon will give satisfaction. Also, when a slightly harder wheel is desired, 16—S Crystolon will usually answer the purpose.

However, the thin, sharp fins that are found on such articles as hard pipe fittings, for instance, call for 16, 20 or 24, grades T and U Crystolon vitrified. Also semi-automatic means of applying certain hard castings (as agricultural links) to the wheel, call for grades T and U Crystolon.

For the average run of white iron castings, the 20—S Crystolon wheel will answer the purpose in 60 per cent. of the cases, the 16—S Crystolon in 20 per cent., and the remaining 20 per cent. will be divided amongst 16—R, 16—T and 20 or 24—U Crystolon vitrified.

Special Treated or "Filled Wheels"

Where the work is applied automatically and continuously, there is great danger of excessive heating, which sometimes causes wheel breakage. Situations of this nature can sometimes be met by using a special treated wheel impregnated with a lubricant which causes freer cutting qualities and hence reduces the heating of the grinding wheel. The treatments usually increase the life of the wheel because much of the dressing is eliminated, and they have been perfected so that they are not thrown out by centrifugal force.

Wheel Speed

It is advisable to maintain a wheel speed ranging between 5,000 and 6.000 surface feet per minute. As in the case of steel castings, when the wheels are worn down so as to reduce the surface speed much below 5,000 s. f. p. m., they should be transferred to higher speeded grinding machines. The variable speed motor-drive is another solution to the problem. In any event, allowing the wheel speed to fall very far below 5,000 s. f. p. m. for a very long period results in increased grinding costs and a falling off in production.

Cost Records

It will be found profitable to keep records of abrasive costs and tonnages obtained from each wheel used, where there is continuous grinding. It is only necessary to keep a record of total tonnage ground per wheel and total life of the wheel. From these two figures, and knowing the cost of grinding wheel consumed, the following values can be computed:

1. Pounds ground per hour—indicating rate of cutting.
2. Abrasive cost per ton of castings ground.
3. Abrasive consumed (cu. in.) per ton of castings ground.

If these values are figured out say monthly, they give the foundry superintendent or manager an accurate record of what his wheels are doing. It is evident that the "abrasive cost per ton of castings ground," does not tell the whole story. This value might be unusually low and yet the total grinding costs might be too high. It is possible to use excessively hard wheels and keep the abrasive cost per ton of castings ground low but the labor cost per unit of output would probably be high and there would be a loss due to lessened production.

It is manifestly good practice to keep factor 2 as low as is consistent with a satisfactory value for 1 and 1 should be carefully based upon what the average grinder can maintain as a fair day's work. In these days when labor is scarce and wages high, it is far better to lean toward the softer, freer cutting wheels which are not so difficult to work upon and which allow the workmen to turn out the castings faster.

The abrasive cost per ton of castings ground will range from 30 to 50 cents in the case of the malleable iron castings and wheels composed of aluminous abrasive.

The keeping of such records makes it easy for the foundry operator to intelligently conduct tests at reasonably frequent intervals to be sure that he is using the best wheels for the work. If the run of castings change, it is perhaps desirable to change the grain or grade of the wheels. The following is a simple method of carrying out such a comparative test:

Mount one of the regular stock wheels on one end of the spindle of a double-end floor stand, and at the same time one of the new wheels to be tested on the other end of the same spindle. Make the two grinders take their castings from the same pile and have them change daily from one wheel to the other. Keep accurate records of wheel life and production and carry the tests from one machine to another, until all have tried the test wheels. The averaged result of such a test tells the story as accurately as it can be obtained. This eliminates the personal factor to a great extent and shows things up in their true light.

Summary

Annealed Castings

1. Use Alundum wheels.
2. Most commonly used wheels 24-Q, 20-R, 20-S Alundum.
    Railroad journal boxes 10-W.
    Automobile castings 20-S.
    Misc. barn hardware 16-Q.
    Heavy railroad castings 16-S.
    Journal boxes, 80 to 140 lbs 10-T.
    Misc. castings, large and small 16-R.

White Iron (Unannealed) Castings

1. Use Crystolon wheels.
2. 16-R, 20-S, 16-S Crystolon most commonly used.
    Agricultural links 16-S and T.
    Pipe fittings 20-S.
    Auto. parts 20-S.
    Parts of metal beds 24-U.
    General smoothing 16-R.
    Small auto. castings 16-R.

—*Grits and Grinds.*

◆

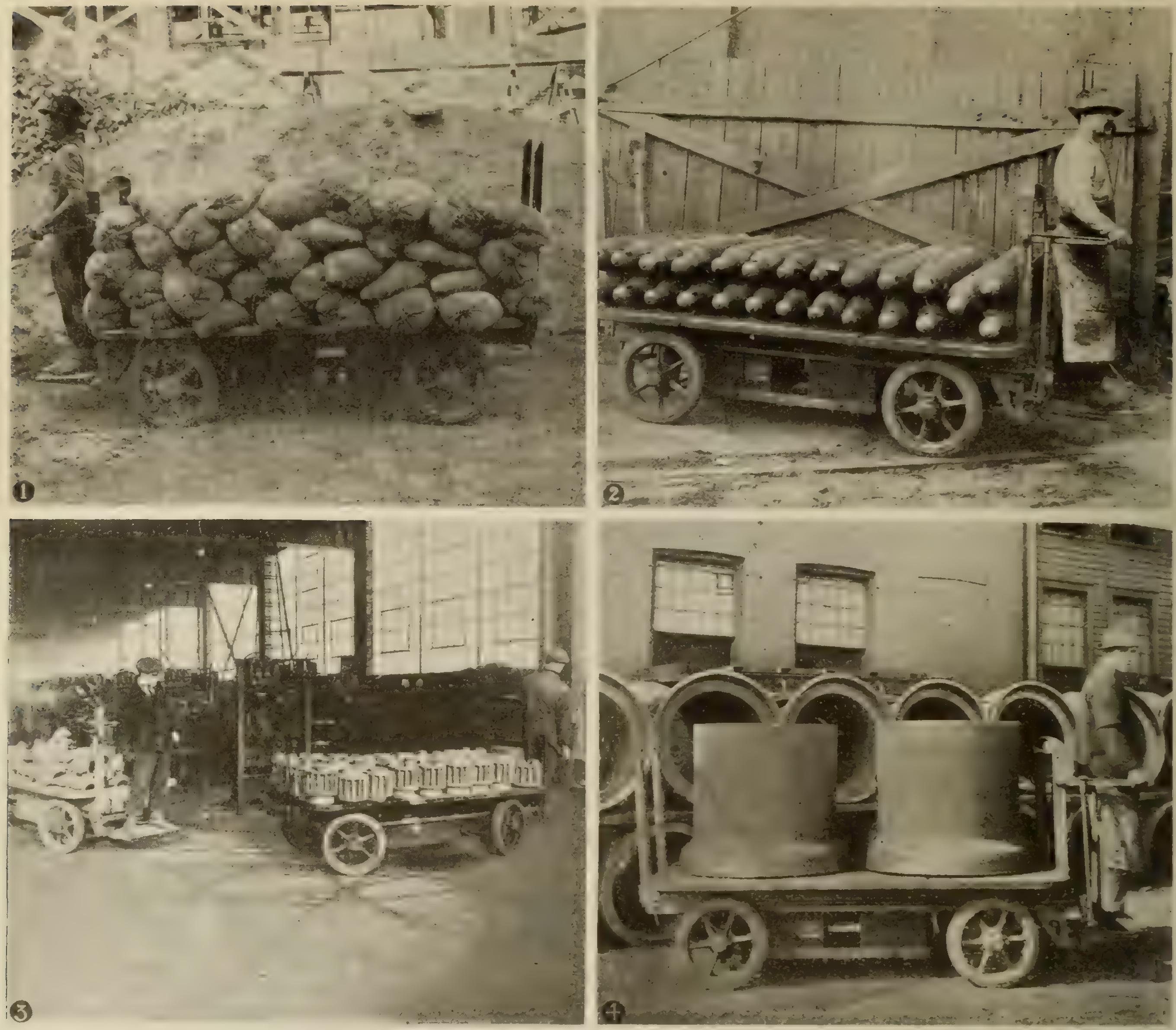
QUESTIONS AND ANSWERS

Question.—One of our girls in the plating department, who has been in the habit of washing her face in hot water taken from the tank where nickel work is washed after plating, has a very sore and inflamed eye, which continually discharges mattery substance and is very painful. We have referred to the article by D. A. D. in Plating Pointers 27, CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS for April, 1913, but it does not deal with cases of this nature. Please advise us regarding treatment; the case is urgent.

Answer.—We assume the water or solution used for washing the plated work is rather strongly alkaline and contaminated by presence of more or less organic matter introduced by means of buffing compound. The actual cause of the painful condition can only be ascertained by careful diagnosis of the case by a conscientious physician or oculist.

With the few details from which we have to form an opinion, we would suggest the following: Dissolve boracic acid in hot water until a saturated solution is obtained. Allow to cool. Apply the solution to the eye by means of an eye cup. The eye should be opened and closed repeatedly during the application to permit contact with entire surface of eyeball and inner lining of eyelids. This treatment should be given hourly throughout the day. At bedtime wash the eye thoroughly in same manner with clean, warm water, and while moist apply to the lids a 2 per cent. ointment of cocaine hydrochloride and white vaseline. Now moisten a piece of lint with hot water and cover the eye. Bind the lint on by means of a bandage. This treatment must be persistently repeated and the eye must not be touched by the fingers or soiled clothes, if a rapid and satisfactory return of normal conditions is expected. The employees in the plating department should be provided with suitable washing facilities, and be instructed to use nothing but soap and clean water on the face. Danger lurks in every pail, tank, pan, crock, or other vessel used in the processes of cleaning, plating or coloring metals, if such containers are employed as wash basins. Furthermore, any solution containing strong cleaning plating or coloring chemicals is absolutely unsafe when habitually employed as a face wash, even though the solution be very dilute. "Safety First."

ABE WINTERS.



ELECTRIC TRUCKS AS USED FOR 1—HAULING CEMENT FOR CONTRACTORS USE; 2—HAULING OXYGEN CYLINDERS; 3—AS USED IN THE FOUNDRY; 4—FOR HANDLING SEWER PIPE.

ELECTRICAL INDUSTRIAL TRUCKS

The lack of labor and the increased wages of to-day would seem to warrant the installation of labor-saving appliances wherever possible in every manufacturing plant, warehouse, railroad, and marine terminal, or wherever material is to be moved in quantities. One of the main advantages of the truck system is that its route is not limited to a fixed portion of a plant or terminal as is the case with overhead chains or other types of carriers. The trucks illustrated herewith are manufactured by the Crescent Truck Company, Elizabeth, N.J. These trucks steer on all four wheels, giving the shortest possible turning radius, enabling the truck to operate in narrow intersecting aisles and runways. Timken worm and worm wheel transmission is used. S K F self-aligning ball bearings and Timken roller bearings are used in the wheels. The hinged platform, when raised, gives immediate access to the entire driving unit and battery.

The transmission is completely enclosed in an oil type housing and runs in a bath of oil; no parts are exposed to pick up dirt and loose materials from the runaway. Battery capacity is unusually large, the truck being able to run without re-charging at a speed from 5 to 7 miles an hour, with a full working load for a ten-hour day.

The frame is made up of four-inch channel steel, thoroughly braced with large gusset plates, and the cross members all riveted together with one-half inch rivets. The truck wheels are driven through a worm differential, giving positive traction. As the whole driving mechanism is enclosed in a housing and continually runs in oil, it is thoroughly protected from dust and dirt.

The wheels are of cast steel, mounted on tapered roller bearings and well provided for lubrication. The tires are of solid rubber, 25 inches in diameter, with 3 and one-half inch face.

The brake is of the internal expanding type lined with asbestos fabric, which is set at all times and has to be released by the operator's foot. A cut-out switch is so arranged as to automatically break the connection when the driver steps off the platform.

The truck is steered by a lever operating vertically, and is directly connected to all four wheels; this steering on all four wheels gives a turning radius of six feet, and allows the truck to enter the side door of a standard box car and run towards either end. All knuckles and joints are provided with lubricating devices.

The controller is of the drum type,, three speeds forward and three reverse, with a positive stop between. The type of battery is optional with the purchaser, being either of the Exide lead type, or of the Edison iron and nickel type. It is of sufficient capacity to operate the truck for a full day's work, or ten hours without recharging.

◆

Canada Iron Foundries Extend.—The contract for the erection of a $75,000 one-storey brick building for the Canada Iron Foundries, St. Maurice street, Three Rivers, P.Q., has been awarded to Nobert, Dugre, and Arsenault.

CANADA'S FUTURE RESTS LARGELY IN HER OWN HANDS

We Hold the Cards, But They Must Be Properly Played —The Testing Time is at Hand Now

By C. GRAHAM DRINKWATER, Vice-Pres. Canadian Fairbanks-Morse Co., Ltd.

You ask what is in store for us as a nation, and my humble answer must be: "Just exactly what we have the ability to make it. We hold the cards but they must be properly played. The test is at hand. We rose to the occasion on the outbreak of war. Our army overseas has made a glorious record, and our army of workers at home has set a new standard in the production of war materials. Canada's prestige never stood higher, and if we apply the same breadth of vision to the period of reconstruction, our success will be assured."

SCRAP DEALERS WAITING FOR IRON AND STEEL MARKET TO SETTLE

THE scrap metal market last week was described as stagnant, and this week a phrase that would fit the situation would be more stagnant. This condition is the same on either side of the international line. Canadian dealers who used to find an outlet for much of their yard tonnage in the American markets are finding no such outlet now. Buyers at U. S. points are not any more anxious for material than they are here. Prices have much to do with the difficulty. These have been for some time at the maximum allowed by the Government. There is a strong tendency now to get away from these, and in this condition much trading is not looked for. Reports from American points give the following:

Chicago—Prices are unsettled here, as there is almost no trading on which to form an opinion. Many of the smaller dealers are out now offering much of their material to the consumers at concessions, but they are not meeting with response even on these grounds.

Pittsburgh—Present Government prices are effective only until the end of the year, and no person is buying in the meantime. Cancellations are made wherever there is any chance, and users are becoming more strict than ever in their inspections, and if the metal is not right up to scratch the rejection of the shipment is certain to follow.

Buffalo—The trade here seems to incline to the belief that all Government control will disappear at the close of the year, and it seems to be the opinion of nearly all that an all-round reduction of $5 per ton will be certain. Both mills and scrap men are waiting for developments.

Cleveland—Dealers are positive in their statements that they will not contract for any material before the first of the year. When the free market comes a break in the prices is looked for. Cancellations show a strong inclination to become more numerous, and although the tonnage affected yet is not very large, a continuation of the tendency might become rather embarrassing.

St. Louis—Sharp cuts were made in the price of many lines here this week. But even the whittled prices hardly represent the real value of material at present. Neither has the cut had the effect of stimulating trade. A few weeks ago dealers claimed that they were shy of all grades of scrap, but as soon as the war ceased they all turned out to have very large offerings to place on the market. They had loaded up at fairly high prices and now they are scampering to unload before the sag in the market becomes any more pronounced.

Birmingham—Dealers here have their own way of figuring out the situation. They hold that not until there has been a settlement of the steel and iron situation will there be any betterment in the scrap business. In any trading that does take place consumers simply make their own bids regardless of price lists.

FORD-SMITH CO. READY TO OPERATE THEIR NEW PLANT NOW

THE Ford-Smith Machine Co., Ltd., of Hamilton, have moved into their new plant on Cavell Ave. This plant is one of the most modern for its size in Canada. While the machine shop is as yet not completely fitted up, the one feature that impresses one all through the plant is the splendid lighting. Every nook and corner is well supplied with daylight. The whole plant seems to be laid out not only for convenience and room for handling large work, but the management has had an eye open for the comfort and welfare of its employees.

The spacious office which has a southern exposure is 60 ft. x 30 ft., is well laid out and well supplied with the most up-to-date equipment. Directly back of this on the east side is the pattern storage room, 60 ft. x 40 ft. This room is thoroughly fireproof and so arranged as to facilitate the handling and storing of patterns.

On the west side is a men's wash room equipped with basins with running hot and cold water. Steel lockers are to be installed here for the men.

Over the wash room is the drafting office. It is well lighted and will be a quiet, cheerful place to work in.

Back of this is the machine shop which is 325 ft. long x 60 ft. wide and ceiling 17 ft. high. The shop is well lighted on both sides by large steel sash windows, with mottled glass to diffuse the light, and is complete with superintendent's office, shipper's office and shipping platform, store room, and tool room. The plant is heated by steam which is produced in a large Spencer heater in the rear of the shop. The shipping department is a raised concrete platform which has a door opening to a railway siding, a covered team-way and side door for small goods. It is complete with platform-scales, office and all necessary equipment.

The floor of the ship is of concrete covered with a heavy maple flooring.

Outside is a spacious yard to be used for storage or extension of buildings. It now has a garage and large bicycle rack.

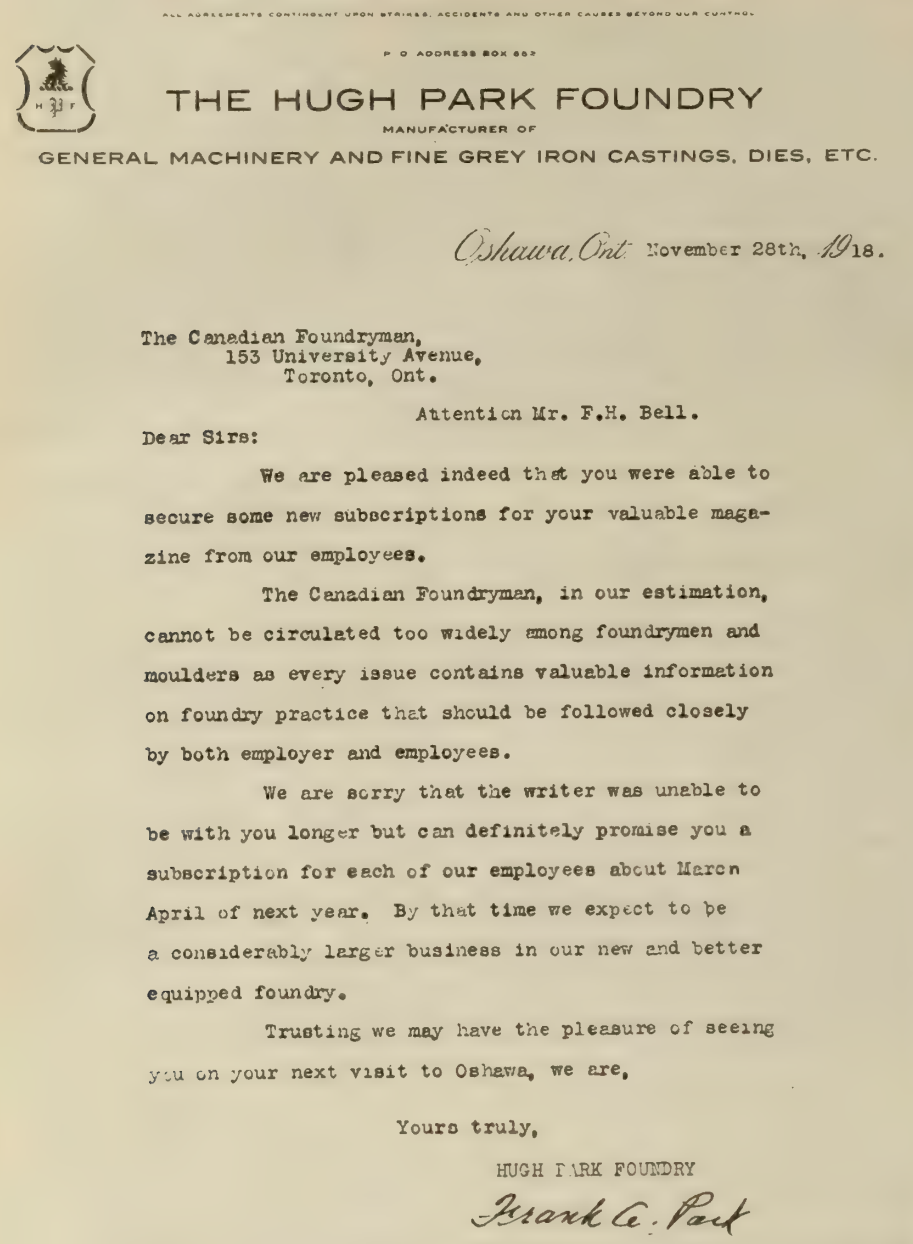
When the shop is completely fitted up it will be equipped to handle the regular line of Ford-Smith grinders and millers, as well as marine engine work, and other special machinery.

◆

Munition Work Stops.—The work of the Imperial Munitions Board is rapidly nearing a close. All work on hand for the U.S. stopped on Saturday last, and the work for the British contracts finishes this week. The Board is trying to sell its properties to industrial concerns. The cost of these properties and all liabilities have been cleared by the profits of operation. These include British Chemical Co. at Trenton and Nobel, a fuse factory at Verdun, and the British Forgings and Canadian Aeroplanes at Toronto.

Halifax, N.S.—An interesting fact in connection with the docking of the big Cunard liner "Aquitania" at New Pier Two recently is that over twelve tugs were employed in assisting the big steamer into her berth. The "Aquitania," coming up the harbor, did not pass to the east of George's Island, as has been customary, but between the island and the Halifax shore. The anti-submarine nets were recently removed by the Naval Department, since when several large steamers have come through this passage. Pilot Henry Latter brought the "Aquitania" into port. She was commissioned in April, 1914, and has done splendid service as a transport ever since.

CANADIAN FOUNDRYMAN appreciates the loyal co-operation of Canadian foundry owners and workers. As an instance of this generous support we here reprint a communication received from Mr. Frank A. Park of the Hugh Park Foundry, Oshawa, Ont.



ALL AGREEMENTS CONTINGENT UPON STRIKES, ACCIDENTS AND OTHER CAUSES BEYOND OUR CONTROL

P O ADDRESS BOX 662

THE HUGH PARK FOUNDRY
MANUFACTURER OF
GENERAL MACHINERY AND FINE GREY IRON CASTINGS, DIES, ETC.

Oshawa, Ont. November 28th, 1918.

The Canadian Foundryman,
153 University Avenue,
Toronto, Ont.

Attention Mr. F.H. Bell.

Dear Sirs:

We are pleased indeed that you were able to secure some new subscriptions for your valuable magazine from our employees.

The Canadian Foundryman, in our estimation, cannot be circulated too widely among foundrymen and moulders as every issue contains valuable information on foundry practice that should be followed closely by both employer and employees.

We are sorry that the writer was unable to be with you longer but can definitely promise you a subscription for each of our employees about March April of next year. By that time we expect to be a considerably larger business in our new and better equipped foundry.

Trusting we may have the pleasure of seeing you on your next visit to Oshawa, we are,

Yours truly,

HUGH PARK FOUNDRY

Frank A. Park

ACETYLENE MINE LAMP

By M. R.

The Chance acetylene mining safety lamp is a combination of the American type of Wolf lamp, with the Mueseler principle, and can be used to detect the presence of fire damp in the mine air and to indicate deficiency of oxygen. It has about five times the illuminating value of the average oil lamp, and 3½ times that of the average electric mining lamp, and is provided with a special reflector which furnishes sufficient illumination of the roof without tilting of the lamp. The upper part follows the construction of the ordinary Wolf-Mueseler lamp, with corrugated shield, double gauzes, and Mueseler chimney, the last having the usual horizontal gauze and protecting disc at the upper end of the cone. Combining the Mueseler chimney with the double glass safety lamp, the Chance lamp is practically two safety lamps in one, and if the outer glass is broken the flame is still protected and cannot cause ignition of gas in the outer air. In the acetylene generator, which is in the base, the contact system is employed. The vessel containing the carbide is closed at the top except for the gas exit, and also at the bottom, except that provision is made for the slow percolation of water. It is immersed in water, which enters it, owing to the pressure due to head, and thus generates gas. The gas pressure inside the chamber automatically controls the admission of water, of which more or less enters as the pressure falls or rises. It is stated that the lamp practically never over-generates, but if it does, the superfluous gas escapes by orifices which lead into the open air downwards, so that the gas is discharged as far as possible from the air inlet, which is above the glasses. A valve is provided to shut off the gas or lower the flame of methane-testing. An objection to acetylene lamps in the past has been that they may be extinguished owing to a little inattention, concussion due to shot-firing, or air-pressure resulting from the sudden closing of ventilation doors. To meet this contingency the lamp has an automatic reigniting burner, so constructed that a temperature sufficient to ignite the gas is maintained partly in the burner itself and partly in the burner protecting the shield. The lamp requires a charge of 7½ oz. to 8 oz. of carbide for 10 to 10½ hours' burning time, and weighs 5¼ lb. when fully charged for a 10-hours shift. After about four hours' working it is desirable to refill the water-vessel; the latter actually contains enough water for a full shift, but during the later hours the gas pressure drops unless more water is added. The lamp is of the lead-rivet type with slip ring, the one lock completely securing both the hole of the generator parts and the internal fittings of the lamp itself.

◆

BISSELL CO. WORKING

Following the rather serious fire at the plant of the T. E. Bissell Co. plant at Elora, plans are already under way for carrying on the work. Speaking to this paper in this regard, Mr. T. E. Bissell remarked: "We have already installed considerable equipment in adjoining buildings, which we were fortunate in having available, and expect to be in a position to resume our shipments of disk harrows, steel land rollers, silos, etc., to our many customers as in the past. The utility and sale of our implements now extends over a wide area, and we have recently made several car load shipments south to the State of Georgia."

◆

Echo of the Russian Shell Contract.—A writ has been issued against the Canada Car and Foundry Co., by William McBain and John Wallison, claiming $375,000 for their share of commissions on certain contracts between the Car Co and the Russian Government. Commission on 5,000,000 shells at 15 cents per shell is involved, half of it being the claim of plaintiffs.

◆

ADVERTISING

Advertising is the education of the public as to who you are, where you are, and what you have to offer in the way of skill, talent or commodity. The only man who should not advertise is he who has nothing to offer the world in the way of commodity or service.

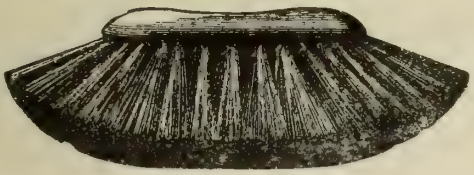
◆

Edward Everett Hale's famous rule of life:

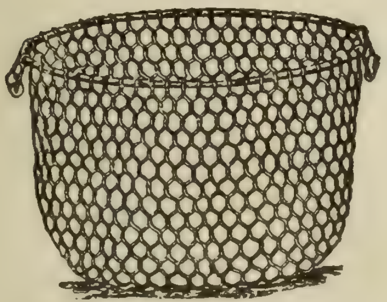
"Look up and not down;
Look forward and not back;
Look out and not in, and
Lend a hand."

These Foundry Ladles are flat bottom riveted steel bowls with forged lips and vent holes.

Bench Rammers as illustrated are made from maple hardwood, thoroughly oiled, 13" long by 4½" diameter.



Moulders' Soft Brushes as above are made from the best quality pure Russian bristle, four inches in length, wire drawn. The block is in two pieces, glued and screwed together.



Coke or Charcoal Baskets of heavy woven galvanized steel wire are strong and durable.

MADE IN CANADA

at Headquarters for

Foundry Facings and Supplies

Exceptional facilities enable us to make quick deliveries from complete stocks.

Ceylon Plumbago No. 101

No better Facing used anywhere than this high-grade "Hamilton" product. Give it a trial.

Ceylon Plumbago No. 206

Used with unequalled success for General Machinery Castings. Put it to the test.

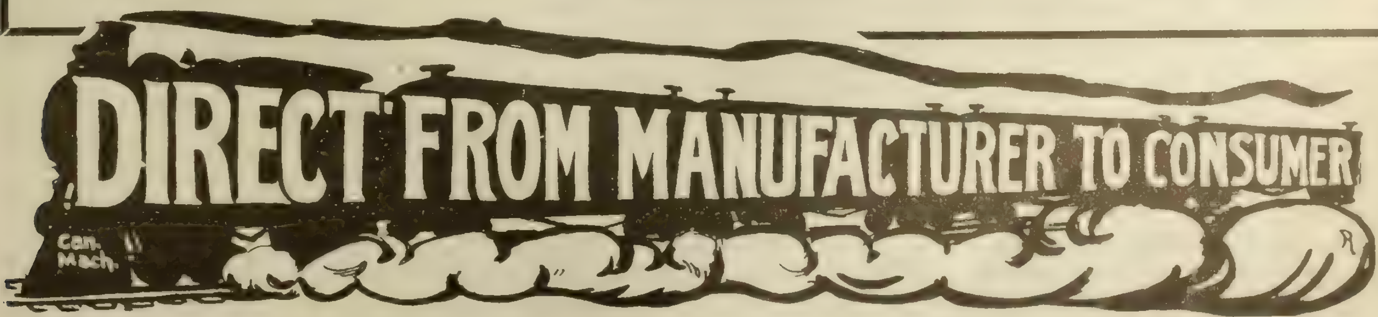
Use our Black Core Compound and you'll have a strong and lasting defence against core room troubles. It is 100% pure.

Special Stove Plate Facing has proved itself superior by a thousand actual tests.

Our Parting is always uniform in quality. It is giving complete satisfaction in many Canadian Foundries.

The Hamilton Facing Mill Co., Ltd.

Head Office and Mill - HAMILTON, ONTARIO


DIRECT FROM MANUFACTURER TO CONSUMER
Can. Mach.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	32 00

Government prices.

	Montreal	Toronto
Hamilton	....	....
Victoria	....	50 00

FINISHED IRON AND STEEL

Iron bars, base	$5 25
Steel bars, base	5 50
Steel bars, 2 in. larger, base	6 00
Small shapes, base	5 75

METALS

Aluminum	$ 52 00
Antimony	17 00
Copper, lake	30 00
Copper, electrolytic	30 00
Copper, casting	30 00
Lead	10 50
Mercury	100 00
Nickel	50 00
Silver, per oz.	0 98
Tin	100 00
Zinc	10 50

Prices per 100 lbs.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$20 00
Copper, crucible	24 50	24 50
Copper, heavy	24 50	24 50
Copper wire	24 50	25 00
No. 1 machine composition	22 00	22 50
New brass cuttings	16 00	15 00
No. 1 brass turnings	15 00	18 00
Light brass	10 00	9 50
Medium brass	12 00	12 00
Heavy brass	15 00	14 00
Heavy melting steel	24 00	22 00
Steel turnings	12 00	12 00
Shell turnings	12 00	12 00
Boiler plate	27 00	20 00
Axles, wrought iron	30 00	24 00
Rails	26 00	23 00
No. 1 machine cast iron	35 00	33 00
Malleable scrap	21 00	20 00
Pipe, wrought	22 00	17 00
Car wheels, iron	38 00	30 00
Steel axles	38 00	35 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	12 00
Stove plate	30 00	20 00
Scrap zinc	6 50	6 50
Heavy lead	7 50	8 00
Tea lead	5 00	5 75
Aluminum	21 00	20 00

COKE AND COAL

Solvay foundry coke	.....
Connelsville foundry coke	.....
Steam lump coal	.....
Best slack	.....

Net ton f.o.b. Toronto

BILLETS.

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.o.b. Pittsburgh.

PROOF COIL CHAIN.

B

¼ in.	$14 35
5-16 in.	13 85
⅜ in.	13 50
7-16 in.	12 90
½ in.	13 20
9-16 in.	13 20
⅝ in.	12 90
⅞ in.	12 90
1 inch	12 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

MISCELLANEOUS.

Solder, strictly	0 55
Solder, guaranteed	0 60
Babbitt metals	18 to 70
Soldering coppers, lb.	0 64
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 05
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English, per lb.	0 35
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls.	0 71
Linseed oil, boiled, single bbls.	1 98
Linseed oil, raw, single bbls.	1 95
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A...list plus	20
Emery cloth ......list plus	0 20
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular.	0 12
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$ 8 00	$ 8 25
Sheets, black, No. 10.	10 00	10 00
Canada plates, dull, 52 sheets	9 00	9 00
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	....	10 70
Premier, 10¾ oz.	....	11 00
Zinc sheets	20 00	20 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$13 00
3-16 in.	12 50
¼ in.	11 75
5-16 in.	11 40
⅜ in.	11 00
7-16 in.	10 60
½ in.	10 40
⅝ in.	10 00
¾ in.	9 90

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, add 20%; B and C, net list; cast iron, 15% off list; standard bushings, 50%: headers, 60%; flanged unions, 40%; malleable bushings, 25 and 7½%; nipples, 55%; malleable lipped unions, 50%.

ANODES.

Nickel	$0.58 to $0.65
Copper	.36 to .46
Tin	.70 to .70
Silver, per oz.	1.05 to 1.00
Zinc	.23 to .25

Prices per lb.

NAILS AND SPIKES.

Wire nails	$5 50	$5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, hydrofluoric	.14½
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.22
Ammonium, carbonate	.33
Ammonium, chloride	.40
Ammonium, hydrosulphuret	.40
Ammonium, sulphate	.15
Caustic soda	.17
Copper, carbonate, anhy	.75
Arsenic, white	.27
Copper, sulphate	.22
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel sulphate	.35
Potassium carbonate	1.80
Silver nitrate ....(per oz.)	1.15
Sodium bisulphite	.30
Sodium carbonate crystals	.05
Sodium cyanide, 129-130%	.50
Sodium cyanide, 98-100%	.38
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.85
Zinc chloride	.90
Zinc sulphate	.20

Prices per lb. unless otherwise stated.

BELTING, NO. 1 OAK TANNED.

Extra heavy, single and double	30-35%
Standard	40%
Cut leather lacing, No. 1	1.55
Leather in sides	1.75

PLATING SUPPLIES.

Polishing wheels, felt, per lb.	$3 25
Polishing wheels, bullneck	2 00
Pumice, ground	07
Emery composition	10 to 6- 9
Tripoli composition	06 to 9-10
Rouge, powder	.30 to .35
Rouge, silver	.50 to .55
Crocus composition	08 to 8- 9

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS PRODUCTS.

Brass rods, base ½ in. to 1 in rd	0 34
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 46
Copper tubing, seamless	0 44

ROPE AND PACKINGS.

Plumbers' oakum, per lb.	.09
Packing square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila rope	33
New Zealand Hemp	.32
Transmission rope, Manila	.45
Drilling cables, Manila	.4
Cotton Rope, ¼-in. and up	.47

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

FILES AND RASPS.

	Per Cent
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

General Market Conditions and Tendencies

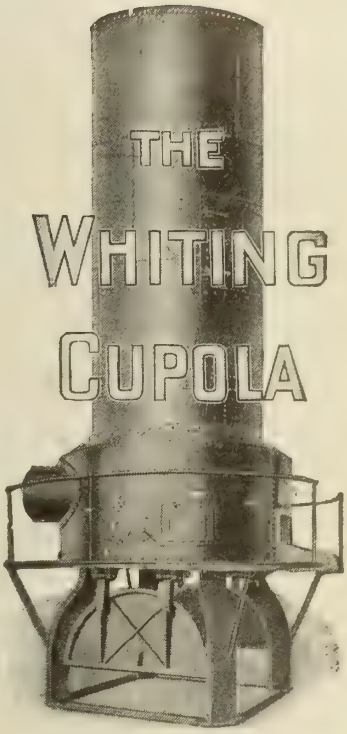
TORONTO.—A softening of prices in several lines of steel products, a little more competitive selling, inquiries for lines that had been out of existence for some months—these things feature the Toronto market situation this week. Although none of them are outstandingly marked, still they indicate the direction of trade.

The Machine Tool Trade

Machine tool dealers in Toronto claim that they have not much single purpose machinery in their warehouses, and that a number of plants that they have taken over on the expiration of contracts contained a large percentage of general purpose tools. Cancellations of 12-inch American contracts this week brought in its trail cancellations amounting to some thousands—a good many in fact. That just about ends the munitions business in Canada. In fact about the only contract still living is that for the 240

Foundry Supplies

Labor Saving and Cost Cutting Equipment of all Kinds



In these days your foundry equipment must be right up to the mark to be able to produce at prices that will secure the orders. Replace any old devices you may have with our labor-saving, cost-cutting equipment.

We are prepared to completely equip your foundry with the most modern, the most durable, and the most satisfactory equipment available. This is possible simply because we handle only the best grade of foundry accessories—Cranes, Hoists, Blowers, Molding Machines, Trucks, Ladles, etc.

Write us your needs. We will gladly give specifications and prices on application.

AIR HOISTS

If you require and want the latest equipment in Air Hoists, let us send you information at once.

The

Dominion Foundry Supply Co. Limited

"Everything for the Foundry"

TORONTO MONTREAL

Agents for Whiting Cranes, Cupolas, Core Ovens Etc.

We also carry a complete range of Core Binders, Hytempite high-grade fire cement, and all other Foundry Supplies.

mm. Motor Trucks at Brantford have that, and if this shop goes along with the work it will be a bit of souvenir in the industry that before long will be only a memory of quantity production and high wages.

One dealer stated this morning that his firm was receiving inquiries for equipment from several centres, and that business was beginning to take on a peace-time appearance. Some of the inquiries promised to run into considerable money. Of course, it will take a long time for this business to grow into the volumes that have been handled by the machine tool dealers in the last few months.

The supply business is smaller in volume this week. A number of decisions will have to be made regarding what lines are to be followed by Canadian manufacturers before there is much of a revival in this business.

The Steel Situation

The mills are not accepting cancellations from the Canadian trade, neither are they considering any price adjustments. As a consequence there is a considerable tonnage coming forward to the warehouses at old prices. The result is that there is going to be an effort on the part of the warehouses, on the arrival of these goods, to dispose of them as quickly as possible. The same rules hold in steel as in any other form of merchandising, and it means in reality that pricecutting will be indulged in. As a matter of fact there have been a number of deals put through in the last few days which show a tendency on the part of the dealers to get rid of their stock at the best price obtainable. Of course, this must not be taken to mean that the skids are under any considerable number of lines, but rather that the old business of competitive selling is again being felt.

"Simply as a matter of form." That seems to indicate the feeling towards the securing of permits from the war trade for orders that are being put through now. There is little delay in getting orders through, and the feeling here is that the whole business of government regulation and allotment is right now living on borrowed life, and is apt to go by the boards almost any time.

A Peculiar Situation

Tubes are coming forward to Canadian dealers in large lots. In fact they can get all the tubes they want now, and almost any kind, or size. Some of those interested in the trade are rather skeptical about the remarkable recovery that is being made in the ability of the mills to furnish the supplies of tubes to Canadian dealers. The tube situation was bad for a good many months. In fact it was impossible to secure a two-inch tube and they were badly needed for repair work. Canadian dealers were told, when they approached the mills on the other side, that it was impossible to give them the stocks they required. Their mills were entirely on war work, and furthermore it was impossible to secure skelp to send to the rollers as the metal was passing through the open hearths to other purposes. Now, almost the day or week that the armistice is signed, the Canadian dealers are informed that their orders, accumulations of weeks or months, are on the road. Certain it is that the tube rollers could not have recovered so rapidly, and it looks as though they had been keeping a strategic reserve against a bad day, and that the Canadian dealers were now being avalanched from this. These tubes are coming in at a fairly high price, and, of course, there will be more or less of a scramble to place them before the era of high values has become a memory. They will likely be sold at a price very close to cost in many cases.

Some Price Changes

As each week, some months ago, saw prices another rung or so up the ladder, so each week now sees the prices crawling down again to levels approaching reason and stability. Sheets (28B) are this week quoted at $7.50 hundred. Last week they were at $8, and not long before that they were trading at $9, and even a little better in some cases. The chances seem to be that they will hang up around the $7 or $7.50 mark. Steel bars are quoted down a little, $5 against $5.50, and iron bars, $4.90 against $5.25. Small shapes, and this heading includes a large variety of material, is placed 25c per hundred down at $5.50 against the $5.75 that has held for some months.

Dealers state that the demand for steel goods is brisk. Business that has been neglected for a long time is coming to life. Apparently the demands come from industries affected principally by the trade of the mines, agriculture and ship building.

Scrap Trade the Same

It may be that the Canadian scrap metal trade is waiting for the U.S. market to make a start. The U.S. market in turn is waiting for the end of the present quarter to run out, as prices are fixed by the Government up to that time, and present demand does not warrant the paying of the limits unless there is a case of real need and quick disposal in connection with the deal.

At any rate conditions in the scrap trade in Canada are almost stagnant. Last week Montreal dealers came out and cut the prices they would offer by big margins. Lines that had been holding around $24 per hundred were brought down to around the $15 mark, but apparently that made little difference. Buyers are not found at either price. As one of the dealers in Toronto stated this morning, "What's the use of naming a price at which you will buy when you don't want to buy anything, and what's the use naming a figure at which you will sell when there's no one in sight who wants to buy?" Well that just about represents the case here at present, and there is nothing in sight at the moment to indicate that a period of greater activity is in sight. Yards are well stocked, too well in fact, and for the present nothing is moving.

NEW ADDITION TO THE GALT FOUNDRY

Galt.—As another evidence of the continuous growth of Galt's industries, particularly on the east side of the city, the Galt Foundry Company, situated on Beverly street near the C.P.R. subway, who specialize in the manufacture of sprinkler stokers, have found it necessary, owing to the large extension of their business, to erect a new machine shop, operations having already commenced on the building, the dimensions of which are 65 by 60 feet and 20 feet in height. The manager, Mr. W. M. McRobert, stated that the company would eventually build a new factory, as there was every prospect of the business growing to large dimensions in the near future. With the present addition to the plant, it will be necessary to take on a number of extra employees.

Other industrial establishments in this locality who have built additions to their plants within the past twelve months, are the Galt Brass Company, macadamized road; the Roelofson Machine Tool Company, and the Galt Machine Screw Company, the two latter also situated on Beverly street.

◆

In "Air Compressors," a publication recently issued by Alley and MacLellan, Ltd., Glasgow, the manufacturers have published a wealth of detail on the compressors and other equipment made by themselves, and the theory of design has been entered into at some length. The action of the Sentinel air compound intercooling compressor is shown, and the various features clearly shown. The valve arrangement, oil pumps, and other details are also shown. An interesting feature of these compressors is illustrated by the actual time taken to dismantle a compressor of 300 h.p. capacity. To remove all valves takes only twenty minutes; to remove the cylinder covers and draw the pistons takes forty minutes, and to completely dismantle the compressor takes 60 minutes more. Test data taken from actual compressor performances are given.

Auxiliary apparatus for compressed air installations is shown, air receivers, meters and other apparatus being shown.

◆

Steel Rails.—Orders have been placed through the War Trade Board at Ottawa for 200,000 tons of steel rails to meet the requirements of the Canadian Pacific, Grand Trunk and the Government Railway systems. The value of this order is about $10,000,000. In addition the Boards of Directors of the several railway companies will proceed with the construction of such car equipment and locomotives as are needed. It is understood that the Canadian Pacific and the Grand Trunk will fill their requirements in their own ships. The aggregate value of car and locomotive equipment required by the several railways will be some $12,000,000 to $15,000,000.

Beats Sandblast Sand 100 to 1

And this "100 to 1" stuff isn't just a claim. It's being done right along in foundries throughout the country. Any user will tell you that ONE BAG OF *DIAMOND GRIT* OR *CHILLED SHOT* WILL LAST AS LONG AND DO MORE WORK THAN 100 BAGS OF SAND.

We'll be glad to prove to you that *"six bags of Diamond Grit cleaned 2,000,000 pounds of brass castings;"* that *"1,000 tons of malleable castings were cleaned at the extremely low cost of $67.20 with Diamond Grit;"* that *a ton of malleable castings can be cleaned at a cost of less than two cents with Diamond Grit.*

Besides this, Diamond Grit or Chilled Shot take up much less storage space than sandblast sand. Shipping is much quicker and the charges less.

If you'll investigate you'll find that the foundries that are using Diamond Grit or Chilled Shot are the ones that are getting out the work right and making the profits.

Samples free—write us.

HARRISON SUPPLY CO.

5 and 7 Dorchester Ave. Extension

BOSTON • • • • MASS., U.S.A

MAKERS OF PIG IRON DO NOT SEE WHERE SLUMP COMES

ALTHOUGH there has been considerable done in the way of cancellation of contracts for pig iron in the United States, there is still a very large volume of business on hand. In many cases cancellations are being refused, the idea being that it is up to the government to continue to control the situation that it brought into existence. Reports from some of the larger points in the United States give the following conditions:

Pittsburgh—The removal of all government restrictions on the shipment of iron is making it possible for the so-called less essential industries to obtain again their normal supplies of iron. A meeting of the pig iron producers of the entire country may be held soon to formulate policies for the readjustment period. Sellers of pig iron continue very optimistic as to the future and show no disposition to make price changes.

Chicago—Producers' representatives are unanimous in saying that they will accept no cancellation unless the government directs that its allocations be annulled, and to date there have been very few instances of this having been done. If allocations are cancelled it would only be fair to cancel all iron ordered for war work.

Philadelphia—Some very large tonnages are now going forward, and it appears that they have been on the books for some time, so it seems certain that there has been more 1919 buying going on in war times than was credited at the time.

Buffalo—No cancellations of any kind are reported, and one producer reports brisk inquiries for small lots, and has taken on several small orders aggregating between one and two thousand tons, foundry grades for first quarter delivery, at present prices. It is considered by many of the furnace men that the only chances for a change will be because of the coke and labor situation. With the opening of the new year it is expected that there will be plenty of business for every one.

Birmingham—Cancellations are still coming in for a considerable total. Inquiries for 1919 are still on the increase. Makers of agricultural machinery are among those who have recently placed orders. Stove works, owing to the limited supply allowed them, have a considerable amount of cast shell iron on the books that has become available, and have shown little disposition toward new buying.

St. Louis—There is no question that domestic needs are such as to keep the plants busy as they are withdrawn from government work, and there is therefore no uneasiness felt as to the continuance of activities in this district.

Cincinnati—Requests for the cancellation of foundry iron contracts with very few exceptions have been refused. Foundries in this vicinity have received a large number of hold-up orders on machine tool and other castings, and so feel justified in asking the furnaces not to crowd them with metal that cannot be used profitably. The change from war to peace work will take place without working any serious hardship.

MARINE

Vancouver, B.C.—The "War Charger," the big 8,800-ton steamer built by the Coughlan Shipyards, has run her trial next vessel to leave will be the "War Noble," which is fast approaching completion.

Kingston. — The bow section of the steamer "Northwest," being taken to the coast, is reported adrift off Charlotte. A terrible gale has been raging on the lake. Tugs have been sent out to look for the vessel, the "Northwest," which is being taken down in two sections.

Midland. — A fleet of United States freighters, with wheat, have arrived here to tie up for the winter. Owing to the congested condition of the elevators and railroads, they will carry their cargoes until spring. There are six in the fleet and all are carrying 400,000 bushels or more. The boats belong to the Pittsburgh Steamship Co.

Quebec.—The Quebec branch of the Navy League have now over 400 boys enrolled, and the League are moving into new, commodious quarters on Metcalf St., Montreal. Negotiations have been under way for some time to acquire a training ship, but it is not expected that one will be obtained before spring.

Toronto.—There is already a large number of enquiries at the local passenger steamship offices, from people anxious to cross the Atlantic. The steamship officials are not yet able to book any passengers, as they have not yet received any definite news as to the ships commandeered by the Imperial authorities. The Imperial Government has issued orders that tourist travel must await more settled conditions.

Vancouver.—The new car ferry "Canora," built for the C.N.R. by the Davie Shipbuilding and Engineering Co., Lauzon, Que., is expected to arrive on the coast shortly. She left Quebec on October 1st for the coast via Panama Canal, and owing to the censorship of shipping news, nothing has been heard of her since. She is about due at San Francisco for coal. She will carry cars between Port Mann and Patricia Bay.

Vancouver, B.C. — The trial trip was held recently of a wooden motor ship for the Pacific coast trade. The vessel was designed by the Taylor Engineering Co., and built by the Vancouver Shipyards Co. The boat is 125 feet long by 23 feet beam, and is fitted with a heavy oil engine of the Bolinder make, 175 horsepower, capable of giving 8½ knots when vessel is loaded. The cargo equipment consists of a power winch, and mast fitted with two 37-foot booms and one 23-foot boom. The electric lighting is handled by a Delco unit lighting set.

New York.—To prove that its prosperity is independent of a state of war, the United States Steamship Co. announces that it has orders for $139,400,000, covering eight wooden and twenty-four steel steamships for the U.S. Government. After the order for the Government is completed, there are 56 steamers on order for private owners, at a total cost of $90,000,000. The profit from the vessels built to private order, being much greater than that from the Government orders, the company's position will improve as the Government orders are completed.

PERSONAL

Capt. Robert Dollar, of San Francisco, passed through Toronto on his way home from the Atlantic Coast. His visit was in connection with the establishment of a Canadian line to the Orient from the Pacific coast. Capt. Dollar is popularly credited with being the original "Cappy Ricks" of Peter B. Dynes' "Saturday Evening Post" series.

I. H. Mills, who has been associated with the Westinghouse Electric and Manufacturing Company, of East Pittsburgh, Pa., for the past twenty-three years, has resigned to become superintendent of the Sperry Gyroscope Company, of Brooklyn, N.Y. Mr. Mills began his career with the Westinghouse as a machine operator, and finally became superintendent of the Small Industrial Motor Department.

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are made to save money by Service
not by single purchase
Forty years leadership --Quality and
Worth maintain it.
McCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.

Why Risk Your Men?

No. 512

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Spring Knee Legging

A very practical legging especially designed for molders and foundry workers. Made of Chrome Tan Leather with extra heavy leather foot flare. Gives full protection without being cumbersome. No straps or buckles. Also made in Asbestos and Fire-proofed Duck.

WHEELER PROTECTIVE WEARING APPAREL

is the surest preventive of accidents to workmen and the resulting loss of time and money in breaking in new men.

Write to-day for complete catalog of the Wheeler Line covering Asbestos, Fireproofed Duck and Leather Gloves, Mittens, Hand Leathers, Finger Stalls, Coats, Pants, Leggings, Spats, Aprons, Helmets and in short every possible kind of protective clothing.

Wheeler Protective Wearing Apparel is a necessity to-day in every modern plant and foundry. Send for our Catalog No. 1—NOW.

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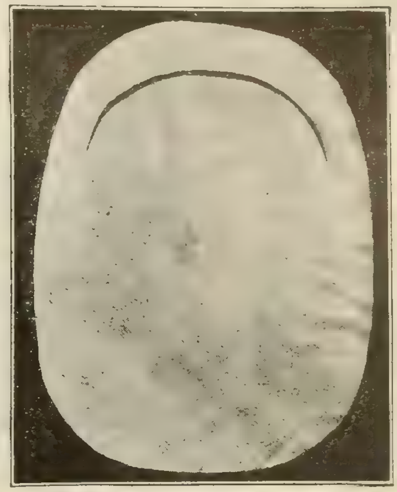

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Hand Leather

A most efficient and practical device made of strong, pliable Chrome Tan Leather. In wide use by men handling heavy castings, sheet plate, etc. Durable and very reasonable in price.

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WANTED—THOROUGHLY CAPABLE FOUNDRY supply salesman. Write, stating experience and salary expected to Box No. 513, Canadian Foundryman. c11m

FOR SALE — 100 MORGANS SALAMANDER Crucibles, for No. 400 Steel Harvey Furnace. The George Taylor Hardware, Ltd., Cobalt, Ont. (c11f)

FOR SALE—ONE MONARCH No. 275 TILTING Furnace, capacity 700 lbs. per heat. One Rockwell Type Tilting Furnace, capacity 5 to 700 lbs. per heat. One 5,000-gallon oil tank complete with motor operated pump, safety valves, etc. One No. 2 Root Pressure Blower, complete with pipe and fittings. Tolland Manufacturing Co., Limited, Montreal, Que.

YOUR Advertisement in this paper will get you results. TRY IT.

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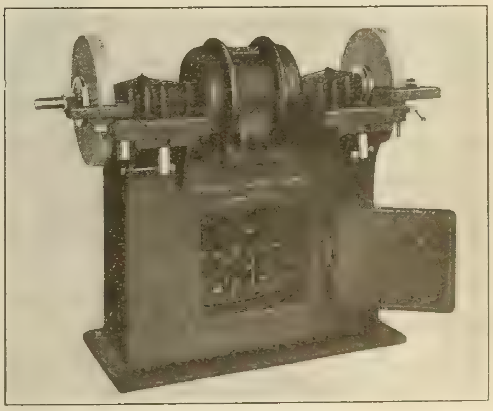
Motor-Driven Grinders

Our Motor-Driven Grinders

are a proven time-saver, and after installation production increases instantly.

Our prices and deliveries sent on request.

Drop us a line.



THE FORD-SMITH MACHINE COMPANY, LIMITED
Hamilton, Ontario, Canada

Trade Mark

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ANGULAR GRIT---THE SCIENTIFIC METALLIC BLASTING ABRASIVE

that reduces sand blast costs and conserves labor. ONE TON of ANGULAR GRIT will do as much work as carloads of sand; its sharp cutting points makes it superior to all other abrasives. Write for samples.

PITTSBURGH CRUSHED STEEL CO., Sole Manufacturers
PITTSBURGH, Pa., U.S.A., Established 1888
Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal, Canada.

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Becoming a Bigger Man

WHAT is the difference between some men you know and others known to you? Why are some men earning $3,000 a year and some $30,000? You can't put it down to heredity or better early opportunities, or even better education. What, then, is the explanation of the stagnation of some men and the elevation and progress of others?

We are reminded of a story. A railroad man, born in Canada, was revisiting his home town on the St. Lawrence River. He wandered up to a group of old-timers who sat in the sun basking in blissful idleness. "Charlie," said one of the old men, "they tell me you are getting $20,000 a year," "Something like that," said Charlie. "Well, all I've got to say, Charlie, is that you're not worth it."

A salary of $20,000 a year to these do-nothing men was incredible. Not one of the group had ever made as much as $2,000 a year, and each man in the company felt that he was a mighty good man.

Charlie had left the old home town when he was a lad. He had got into the mill of bigger things. He developed to be a good man, a better man, the best man for certain work. His specialized education, joined to his own energy and labor sent him up, up, up. To put it in another way: Charlie had always more to sell, and the world wanted his merchandise—brain, skill and ability. Having more to sell all the time, he got more pay all the time.

Charlie could have stayed in the old home town; could have stagnated like others; could have been content with common wages. In short, Charlie could have stayed with the common crowd at the foot of the ladder. But Charlie improved himself and pushed himself, and this type of man the Goddess of Fortune likes to take by the hand and lead onward and upward. Almost any man can climb higher if he really wants to try. None but himself will hold him back. As a matter of fact, the world applauds and helps those who try to climb the ladder that reaches towards the stars.

The bank manager in an obscure branch in a village can get out of that bank surely and swiftly, if he makes it clear to his superiors that he is ready for larger service and a larger sphere. The humble retailer can burst the walls of his small store, just as Timothy Eaton did, if he gets the right idea and follows it. It is not a matter of brain or education so much as of purpose joined to energy and labor. The salesman or manager or bookkeeper or secretary can lift himself to a higher plane of service and rewards if he prepares himself diligently for larger work and pay. The small manufacturer, the company director, the broker—all can become enlarged in the nature of their enterprise and in the amount of their income—by resolutely setting themselves about the task of growing to be bigger-minded men.

Specialized information is the great idea. This is what the world pays handsomely for. And to acquire specialized information is really a simple matter, calling for the purposeful and faithful use of time. This chiefly.

One does not have to stop his ordinary work, or go to a university, or to any school. One can acquire the specialized information in the margin of time which is his own—in the after-hours of business. Which means: If a man will read the right kind of books or publications, and make himself a serious student at home, in his hours—the evening hours or the early morning hours—he can climb to heights of position and pay that will dazzle the inert comrades of his youth or day's work.

IF business—BUSINESS—is your chosen field of work, we counsel you to read each week THE FINANCIAL POST. It will stimulate you mentally. It will challenge you to further studious effort. It will give you glimpses into the world of endeavor occupied by the captains of industry and finance. With the guidance of the POST, and with its wealth of specialized information, you, a purposeful man, aiming to go higher in life and pay, will find yourself becoming enlarged in knowledge and ambition, and will be acquiring the bases and facts of knowledge which become the rungs of the ladder you climb by.

It is the first step which costs. But this cost is trivial—a single dollar. We offer you the POST for four months for a dollar. Surely it is worth a dollar to discover how right we are in our argument. If yoou have the will to go higher in position and pay, sign the coupon below.

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—143-153 University Avenue, Toronto.

Send me us THE FINANCIAL POST for four months for one dollar.

Money to be enclosed remitted

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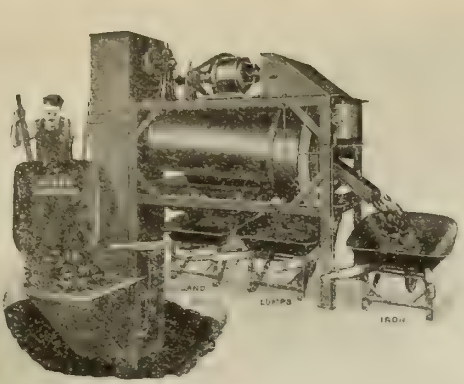

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Will save that waste iron and screen your sand as well.

Our Type "F"

Separators require no shoveling. Simply dump the material into the grizzly.
Note elevator feature. Magnetic separator can be furnished without this feature if desired, thus reducing cost.
One of Canada's largest foundries has just ordered one. Name supplied on request.

They Save Labor and Metal

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Battle Creek Sand Sifter

This is just one of our cost-cutters and labor-savers. Send for catalog of full line.

Pay You to Install This Machine

This machine will do more and better work than any machine of its kind on the market. Does five times more work than a riddle sifter. Soon pay for itself. Any foundry supply house can furnish this or any other of our machines.

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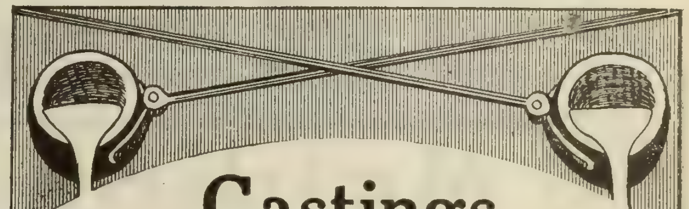

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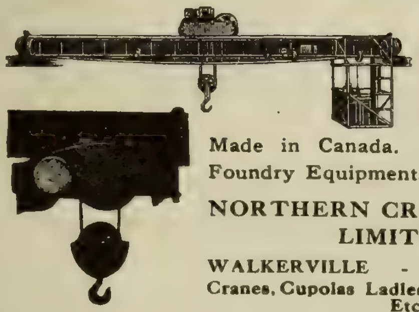

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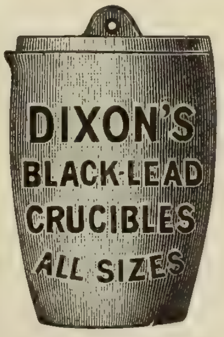
Cranes, Cupolas Ladles, Hoists, Tumblers Etc.



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CRUCIBLE COMPANY
Established 1827

To Classified Advertising Section

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INDUSTRIAL CHEMISTS

Analyses and Tests on all Materials used in Foundry Work
Expert Metallurgists and Practical Foundrymen
For Your Foundry Problems.

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Molding and Core Sand

HAS WON HIGH RANK

in the victorious world war. Now—let it render still greater service in the arts of Peace.

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Its great resistance to HIGH TEMPERATURES.
Its uniformity in size, hardness and roundness of granules.

And the marked degree to which its use reduces machining labor–all have given FLINT SILICA a place of high favor among steel-founders whose opinions carry weight.

We can make immediate shipment in any number of carloads.

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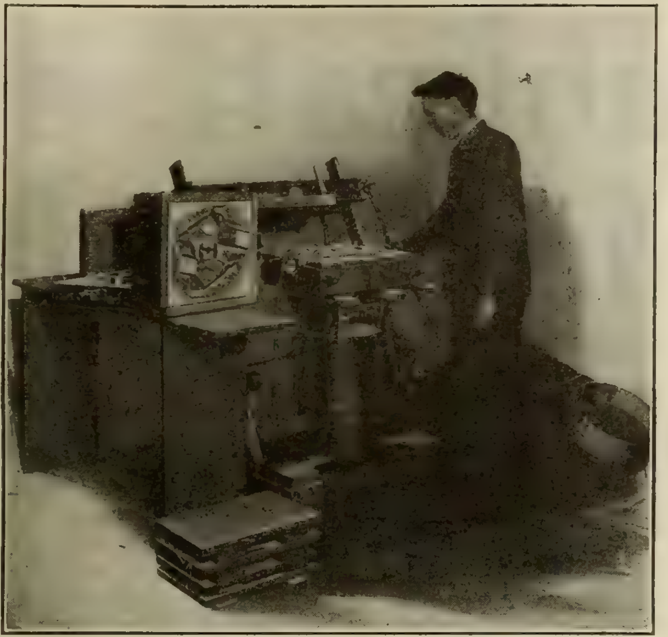

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has recovered hundreds of thousands of IRON dollars buried in the refuse dumps of more than 2,500 Foundries.

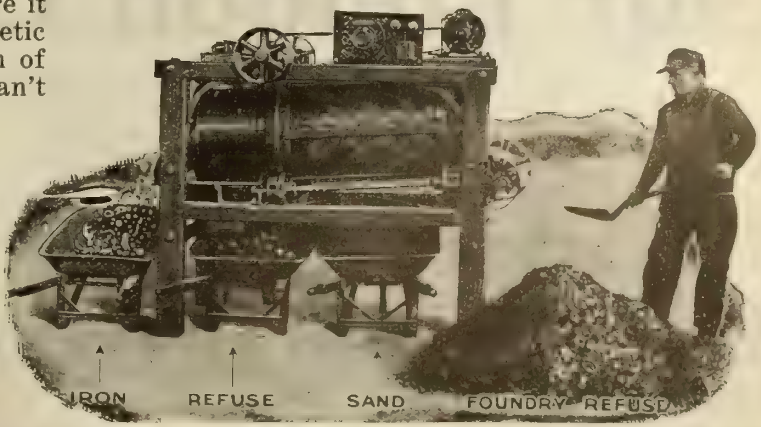
The proverbial needle in a haystack—were it **iron**—could not elude this Dings Magnetic Separator. It gives you back all the iron of value and practically all the sand. You can't afford to do without it.

Write for Catalog No. 16.

Dings Magnetic Separator Co.
800 SMITH STREET
Milwaukee Wisconsin

It is installed without expense. One type—the motor-driven—can be set to work as soon as unloaded. The other, which is belt-driven, is ready as soon as the belt is hooked up.

Make sure that you secure **the separator that never clogs.**



The MacLean Business & Class Publications in Canada

TO SELL or buy from Canada such lines as machinery, hardware, food products, dry goods, books and stationery, paper, printing machinery and supplies and general merchandise of almost every description, raw or manufactured, use or consult the MacLean Business and Class Publications, as per list below. For special information, write the publishers. Concerning the quality of the MacLean publications, let this copy of POWER HOUSE which you hold in your hands speak for all. The MacLean list of 14 publications is as follows:—

The Canadian Grocer (Est. 1886)
Serving the Grocery, Provision and Foodstuffs Trades. Published weekly.

Hardware and Metal (Est. 1889)
Serving the Hardware, Stove and Metal-working Trades. Published weekly.

Dry Goods Review (Est. 1889)
Serving the Dry Goods Trade generally; Wholesale, Retail, Manufacturing and Department Stores. Published monthly.

Men's Wear Review (Est. 1898)
Serving the Manufacturers of Clothing, Underwear, Shirts, Collars, Neckwear, Footwear, Hats and Caps and Allied Sundries, and their Retail Distributors. Published monthly.

Canadian Machinery (Est. 1905)
Serving the Machinery, Metal-working, Iron and Steel, Foundry and Allied Trades. Published weekly.

The Power House (Est. 1907)
Serving the Operating and Consulting Engineers and Power Superintendents. Devoted to the Generation, Transmission and Application of Steam, Gas, Electric, Air and Water Power; and to the operation of Refrigerating Machinery. Published monthly.

Bookseller and Stationer (Est. 1884)
Serving the Book, Stationery, Fancy Goods and Associated Trades. Published monthly.

The Sanitary Engineer (Est. 1907)
Serving the Manufacturers of Sanitary, Heating and Ventilating Machinery, Systems and Equipments, and those installing them. Published semi-monthly.

Marine Engineering of Canada (Est. 1910)
Serving the Marine Engineering, Merchant and Shipbuilding Trades. Published monthly.

Canadian Foundryman (Est. 1909)
Serving Foundries and the Pattern-making, Plating and Polishing Trades. Published monthly.

Printer and Publisher (Est. 1892)
Serving the Publishing, Printing, Paper-making and Allied Trades. Published monthly.

The Financial Post (Est. 1907)
Serving the Business, Investment and Financial Interests of Canada. Published weekly.

MacLean's Magazine (Est. 1896)
A popular family and literary magazine; the most important in its field in Canada. Published monthly.

The Farmers' Magazine (Est. 1910)
Serving the agricultural and rural communities of Canada. The only farm and country life publication in Canada having extensive national circulation. Published semi-monthly.

This fact may interest you: namely, the MacLean organization is the largest concern of its kind in the British Empire. The output of its mechanical department every working day is the equivalent of a 125-page publication of the size and type of this copy of *Power House.*

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For over 20 years the MacLean Publishing Company has maintained a fully-staffed London office, and has rendered British and Continental manufacturers, shippers, and traders an invaluable service in many directions.

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Peerless Perfect Parting Compound

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Esso Plumbago Core Wash

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Rillton Sea Coal Facing
"Kantbebeat" Core Compound
"Bull Dog" Core Wash
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"All These Brands stand for Efficiency and Reliability"

Bull Dog Core Wash

Car Wheel Core Compound

EVERYTHING YOU NEED IN YOUR FOUNDRY.

Esso Cream Soapstone

No. 440 Mica Core Wash

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XX Peerless Core Oil

Rillton Sea Coal Facing

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

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Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

AIR COMPRESSORS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

ANALYSIS
Hersey Co., Ltd., Milton, Montreal, Que.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BOILERS
Rodgers Boiler & Burner Co., Muskegon, Mich.

BOILER GRAPHITE
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

BLOWERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

BLAST GAUGES—CUPOLA
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRICKS, RUBBING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRIQUETTING
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

BRUSHES, FOUNDRY AND CORE
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Manufacturers' Brush Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CARBON BLACKING
Hyde & Sons, Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

CAR MOTORS
Can. Ingersoll-Rand Co., Montreal, Que.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, ETC.
United Brass & Lead, Ltd., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
United Brass & Lead, Ltd., Toronto, Ont.
W. W. Wells, Toronto.

CASTINGS, MALLEABLE IRON
Fanner Mfg. Co., Cleveland, Ohio.

CHAPLETS
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Fanner Mfg. Co., Cleveland, Ohio.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

CINDER MILLS
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.

CLAMPS, FLASK
Obermayer Co., S., Chicago, Ill.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Wm. Demmler & Bros., Kewanee, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
United Compound Co., Buffalo, N.Y.

CRANES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Hyde & Sons, Ltd., Montreal, Que.
Woodison, E. J., Co., Toronto, Ont.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Eng'r'g Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DYNAMOS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
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Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

FACINGS
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FIRE BRICK AND CLAY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont

FIRE CEMENT
Stodder, W. F., 218 S. Geddes St., Syracuse, N.Y.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY MIXERS
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PRACTICE
Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY SUPPLIES
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.

FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Hyde & Sons, Montreal, Que.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

ASBESTOS, DUCK AND LEATHER GLOVES
Wheeler Mfg. Co., Chicago.

GOGGLES
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

GRANITE AND MARBLE POLISHING
Harrison Supply Co., Boston, Mass.

GRANITE CUTTERS' TOOLS
Harrison Supply Co., Boston, Mass.

GRANITE AND MARBLE POLISHERS' SUPPLIES
Harrison Supply Co., Boston, Mass.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

GRINDERS
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Ingersoll-Rand Co., Montreal, Que.

GRINDERS, DISC, BENCH, SWING
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

GRINDERS, RESIN
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRIT, ANGULAR
Harrison Supply Co., Boston, Mass.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT, STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING
Can. Ingersoll-Rand Co., Montreal, Que.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
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Can. Ingersoll-Rand Co., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, HAND, TROLLEY
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Toronto, Ont.

INGOTS, BRIQUET
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

INGOTS, COPPER, BRASS, BRONZE AND NICKEL
Eastern Brass & Ingot Corp., Waterbury, Conn.
Metal Block Corp., Chicago, Ill.

IRON CEMENTS
Can. Fairbanks-Morse Co., Montreal, Que.
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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hyde & Sons, Montreal, Que.
Stevens, Frederic B., Detroit, Mich.

IRON FILLER
Can. Fairbanks-Morse Co., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

IRON SAND
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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LEGGINGS
Wheeler Mfg. Co., Chicago.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hersey Co., Ltd., Milton, Montreal, Que.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

MITTENS
Wheeler Mfg. Co., Chicago.

MIXERS
National Engineering Co., Chicago, Ill.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Britannia Foundry Co., Coventry, Eng.
Can. Hanson & Van Winkle Co., Toronto, Ont
Cooper Saddlery Hardware Co., H. W., Moline, Ill.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Federal Malleable Co., West Allis, Wis.
Hamilton Facing Mill Co., Hamilton, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

NOZZLES, SAND BLAST
Stodder, W. F., 218 S. Geddes St., Syracuse, N.Y.

NICKEL, CHROME
Walker & Sons, Metal Products, Hiram, Walkerville, Ont.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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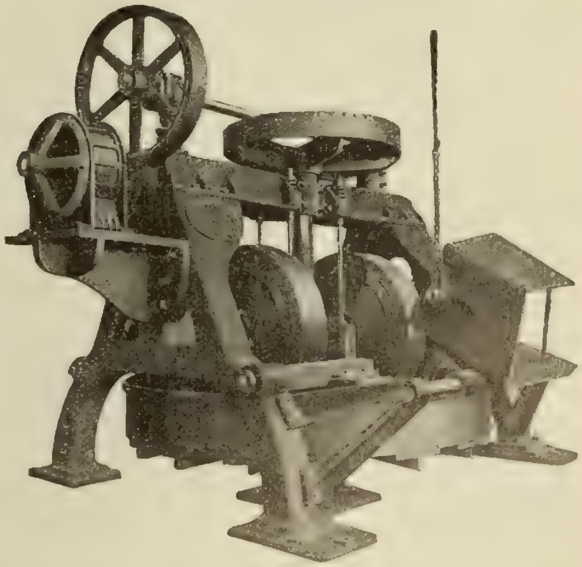

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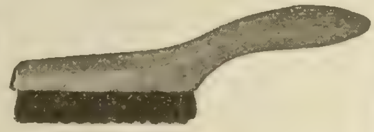

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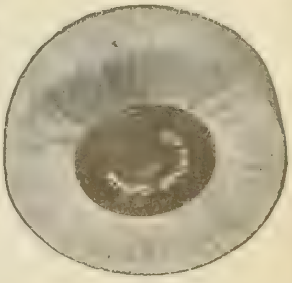

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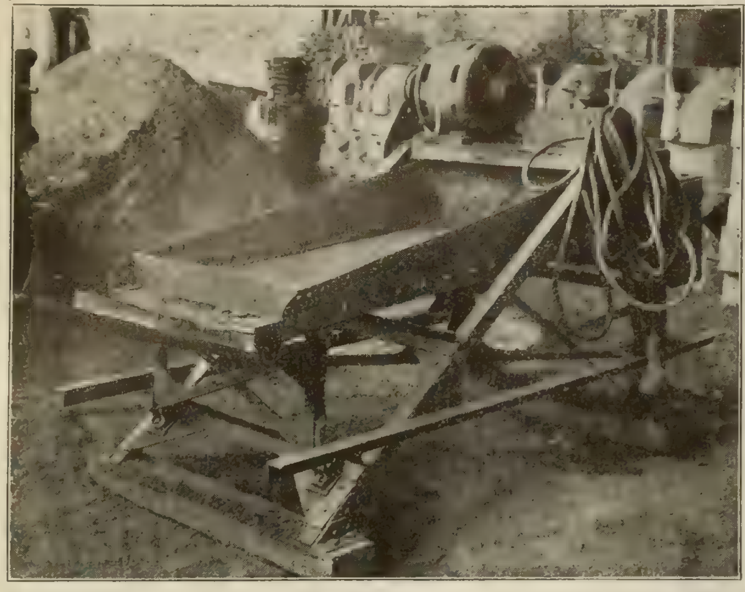

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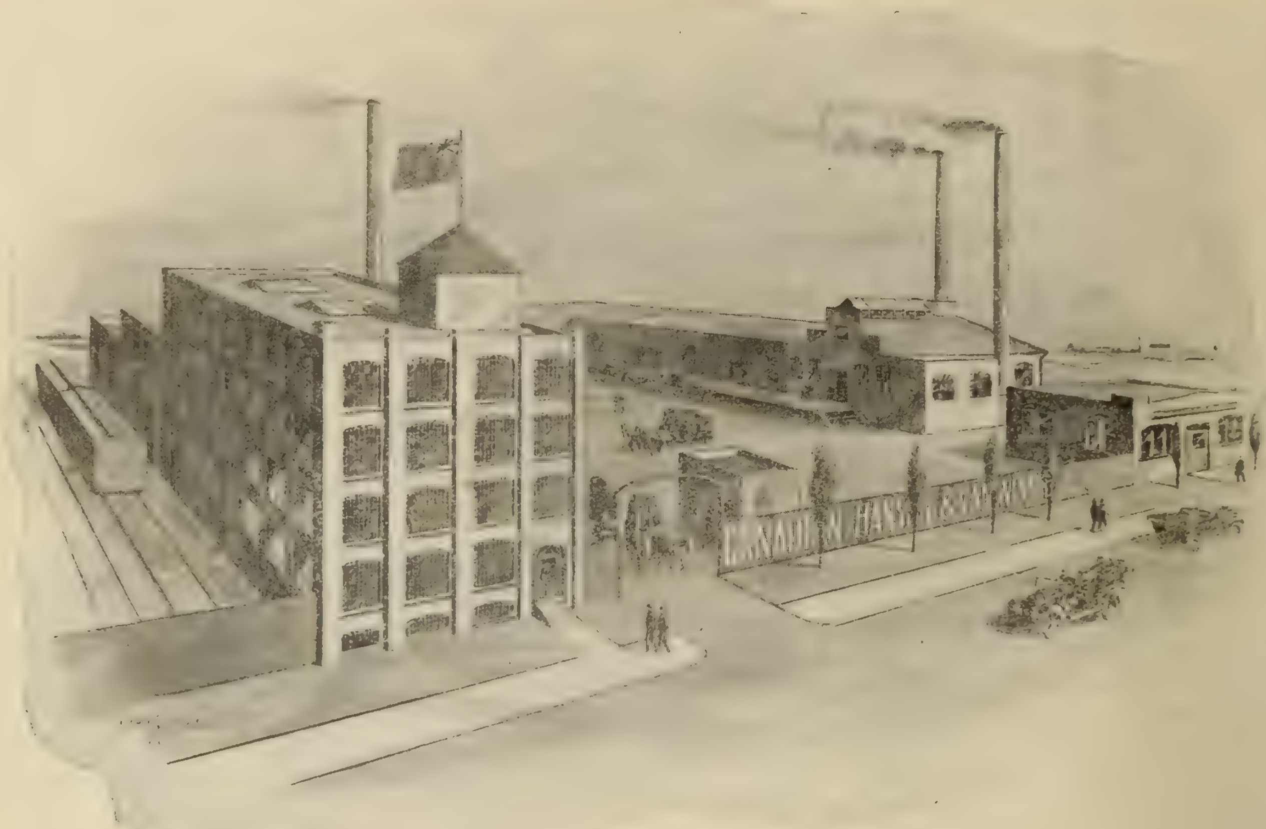

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